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THESIS

COMBINED ARMS TRAINING PROGRAM COST ANALYSIS

by

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December 1980

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Combined Arms Training Program Cost Analysis

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TABLE OF CONTENTS

LIST OF EXHIBITS

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I. INTRODUCTION

A. GENERAL BACKGROUND

The Marine Corps Air Ground Combat Center (MCAGCC) is located at Twentynine Palms, California and is the Marine Corps' training base for conducting Combined Arms Exercises (CAX). It has the mission of developing, administering, and evaluating the Combined Arms Training Program (CATP) [13:1]. A CAX is a training exercise which simulates actual combat by integrating the employment of ground and air combat elements, including naval gunfire. Ten of these exercises are conducted annually [13:8].

B. PROBLEMS IN FINANCIAL CONTROL AND PLANNING

The need for the Combined Arms Training Program is underscored by the emphasis placed on the exercise by the Marine Corps. In view of financial difficulty encountered by all levels of governmental entities, it is imperative that programs such as the CATP be conducted as efficiently as possible. Unfortunately, the financial planning and control system of the program leaves much to be desired. For one thing, no reasonably accurate estimate has ever been made as to what the cost of a CAX should be, which leads to the difficulty of budgeting for the CATP. For another, the program lacks a system for appropriate cost determination of each exercise,

thus making it impossible to financially evaluate the exercises. Through personal interviews with the personnel at MCAGCC and study of financial data from previous exercises, five specific problems were identified:

1. Lack of Standard Equipment Issue

The types and optimal amounts of equipment needed in order to properly conduct a CAX have not been identified.

2. Lack of Standard Supply Issue

The types and optimal amounts of supplies needed to conduct a CAX have not been identified.

3. Lack of Standard Ammunition Issue

The proper amounts of ammunition needed in order to conduct a CAX have not been identified.

4. Lack of Centralized Control and Budgeting System

No command has overall responsibility for controlling the resources that are used during a CAX to insure they are not being wasted. This is due mainly to the present CATP budgeting system.

5. Inadequate System for Separating, Identifying, and Reporting CAX Costs

No coordinated system by which CAX costs may be identified, separated, and reported exists at this time.

C. OBJECTIVE

The purpose of this thesis is to develop a method by which costs of the CATP may be accurately estimated, thereby making

budgeting for this program significantly less difficult. The research effort will be directed toward the five specific problems mentioned above. Therefore, the specific objectives of this thesis are as follows:

1. To develop a standard equipment issue.

2. To develop a standard supply issue.

3. To develop a standard ammunition issue.

4. To stress the advantage of a centralized control and budgeting system.

5. To identify what must be done in order to provide an adequate system of identifying, separating, and reporting CAX costs.

D. RESEARCH QUESTIONS

Answers were sought for the following research questions:

1. What command has been assigned the overall responsibility for insuring that the CATP is conducted efficiently?

2. What system is presently used to budget for CATP costs?

3. What system is presently used to account for and report CATP costs?

4. Are the above systems adequate?

5. Are there any advantages of centralized control and budgeting systems over individual control and budgeting systems?

6. What types and amounts of equipment were used in prior CAXs?

7. How much of the equipment used in prior CAXs was furnished by MCAGCC, and how much of it was transported to Twentynine palms by the participating units?

8. What types and amounts of supplies were used in prior CAXs?

9. How are the types and amounts of necessary supplies determined?

10. What happens to excess supplies at the conclusion of each CAX? Are they counted as a cost of the CAX?

11. How much ammunition was used in prior CAXs?

12. What happens to excess ammunition at the end of each CAX?

13. Is there any indication that explosive ordnance personnel are disposing of extraordinary amounts of ammunition? If so, why?

14. What are the cost elements associated with the CATP?

15. Which of these cost elements are controllable?

16. What are the advantages of using standards in estimating costs?

17. If a standard CAX is developed, can its estimated cost be compared with the cost of previous CAXs?

18. What workload data is available from previous CAXs?

19. Is this data accurate and reliable? If so, does it lend itself to analytical techniques, i.e. regression?

20. If analytical techniques cannot be used, what method can be used to develop a standard issue of supplies and equipment and to estimate the cost of a standard CAX?

E. METHODOLOGY

The method of research used to conduct this study was as follows:

1. Literature Search

To become knowledgeable of budgeting and cost accounting systems, and how standards should be used, a literature search was conducted through the Naval Postgraduate School Library to locate past studies that relate to the study presented here. A literature search was also performed by the Defense Logistics Studies Information Exchange. This search proved to be helpful in the preparation of Chapters III, IV, and V.

2. Field Observation

Five days were spent at the Combat Center for discussion with various members who are directly involved in conducting the program. Associated problems were defined and data to be collected were identified. Knowledge gained was helpful in the preparation of Chapter III which discusses the issues involved in detail.

3. Data Collection

Some data were collected during the time spent at the Combat Center. Other data were compiled by various units at a

later date. This data included information as to the amounts of supplies and equipment used in previous CAXs, as well as their cost, broken down by cost component. For each CAX, workload data such as aircraft flight hours, vehicle mileage, and hours of operation for other types of equipment were collected. This data were used in Chapters VII through X.

4. Analysis

The analytical procedure of this study was to identify all costs associated with the CATP, determine which of these costs are controllable, and determine if controllable costs were being controlled. Many costs were too high because they reflected the inefficient use of resources. In order to minimize resources waste a standard issue of supplies and equipment for a CAX was developed. The advantage of centralizing CATP control and budgeting at MCAGCC, from an efficiency standpoint, were identified. The analytical portion of the study includes Chapters VI through X.

F. SCOPE

This thesis is directed primarily at the efficiency of the CATP. That is, how may resources best be utilized so that CATP costs will not be excessive, and so planning the CATP budget will be simple and accurate. Effectiveness of the CATP is beyond the scope of this study. This study is limited to the issues of what must be done in order to more accurately estimate the cost of a CAX for planning and control purposes.

G. ORGANIZATION

The thesis is organized into the following 11 chapters:

I. Introduction

A brief overview of the contents of the thesis is given.

II. Background of the CATP

This chapter explains why the CATP is needed and the type of training that it provides. All participating units are identified and the objectives of the MCAGCC are explained.

III. Problem Clarification

The overall problem associated with the financial side of the CATP is explained and five specific problem areas are identified, of which three are discussed in detail in this chapter. The other two are more theoretical in nature and are discussed in detail separately in Chapter IV.

IV. Behavioral Implications of the Existing Training Cost Budgeting System

This chapter discusses the remaining two specific problems of the program. It provides an explanation of the existing CATP budgeting system pointing out its weaknesses from the standpoint of predicting, budgeting for, and controlling CAX training costs. The issue to be discussed revolves primarily around centralized control and responsibility for the funds and resources used to conduct a CAX. Also discussed are the problems caused by the existing CATP budgeting system in separating, identifying, and reporting CAX costs.

V. Advantages of a Centralized Control and Budgeting System

This chapter identifies the specific advantages of centralizing control of and budgeting for CATP resources with MCAGCC.

VI. Identification of Cost Components

This chapter identifies all components of cost that are attributable to that CATP. The organizational units which incur these costs are also shown.

VII. Critique of CAX Cost Reports

This chapter critiques the present CAX cost report by identifying its weaknesses and describing what may be done to correct these weaknesses.

VIII. Standard CAX Resources

This chapter develops a standard amount of resources to be used in a CAX.

IX. Cost Analysis of Previous CAXs

This chapter analyzes in detail the costs that were reported for CAXs 4-80 through 7-80, and contrasts them with the costs that should have been reported.

X. Standard CAX Cost

This chapter estimates the cost of a CAX based on the standard resource levels that were developed in Chapter VIII and compares it to the cost of previous CAXs.

XI. Summary, Conclusions, and Recommendations

This chapter summarizes what has been accomplished in this study. Based on the analysis of the existing CATP cost accounting system and the cost reports of past CAXs, conclusions regarding the financial side of the CATP are made. Recommendations for potential improvement of the financial planning and control system for the program are listed.

II. COMBINED ARMS TRAINING PROGRAM

A. MISSION AND NEED

Under the CATP, ten CAXs are conducted annually. This program is very expensive due to the fact that a large amount of supplies, equipment and ammunitions must be expended and a large expenditure of funds must be made simply to transport personnel to and from the Combat Center. Given the large amount of resources consumed in each exercise, one may wonder why so much emphasis is being placed on this type of training. The reason is clearly stated in the Marine Corps Air Ground Combat Center Order 3500.11, paragraph two, which reads as follows:

> The increasing level of sophistication in tactics, techniques, and weapons systems found on the modern battlefield requires that Marine Corps organizations be thoroughly trained in combined arms operations. There is a need to exercise and evaluate new doctrinal concepts and equipment as well as to improve the basic skills involved in the integration and coordination of supporting arms with maneuver elements of the air-ground team. Current coordination efforts must emphasize the need for mutual support to achieve the full effectiveness of each combat arm. Traditional concepts of a certain combat arms in a supporting versus a supported role must give way to the mutual support (teamwork) concept where every combat arm is equally prepared to provide support as it is prepared to be supported [13:1].

The mission of MCAGCC is to develop, administer, and evaluate the CATP [13:1]. Paragraph three of MCAGCC Order 3500.11 states that the following sub-missions are implicit in this overall mission [13:1-2]:

1. Establishment of exercise control of all units and forces participating in a CAX.

2. To provide realistic training under live fire conditions.

3. Employment of all available supporting arms with emphasis on fire support planning and coordination.

4. Total integration of close air support with tactical schemes of maneuver.

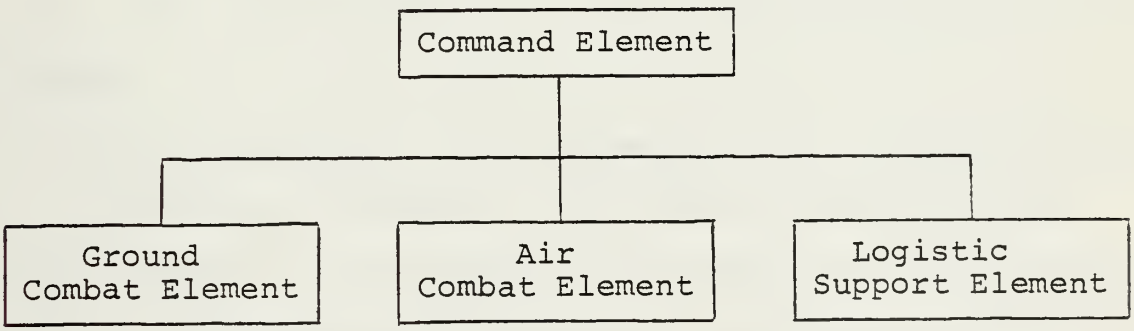
5. Mechanized operations in an armor threat environment.

6. To examine and evaluate current doctrine.

7. To provide facilities and certain logistical and administrative support to organic and tenant units.

B. ORGANIZATION OF THE EXERCISE FORCE

To better understand what a CAX consists of, it would be helpful to know how the various units involved are organized. A Marine Amphibious Unit (MAU) is organized as shown below:



1. <u>The Ground Combat Element</u>

The Ground Combat Element's (GCE) primary mission is to locate, close with, and destroy the enemy by fire and maneuver, or to repel his assault by fire and close combat. The GCE can be of different sizes, but the one that is formed for the purpose of conducting a CAX is a Battalion Landing Team (BLT). A BLT is the basic infantry battalion combined with combat support and combat service support units. The minimum level of a BLT for a CAX, as specified by MCAGCC Order 3500.11, is as follows [13:ENCL(2); P. 1-2]:

(1) Battalion Headquarters - An infantry battalion headquarters consists of the following:

a. All principal battalion staff officers.

b. Complete Fire Support Coordination Center (artillery, naval gunfire, air, 81mm mortar sections).

c. Artillery forward observers and 81mm mortar forward observers for each committed company.

d. Two forward air control teams and two naval gunfire teams.

(2) Three assault rifle companies with crew-served weapons.

(3) Artillery Support - The primary mission of the artillery component is to provide fire support to the infantry battalion. For purposes of conducting a CAX the minimum participation level has been established as follows:

a. One 105 battery with four tubes in direct support.

b. One reserve battery with four tubes in general support.

c. Two tubes simulating naval gunfire.

d. Six tubes of 81mm mortars.

(4) Armor Support - The primary of the tanks is to provide combat power to the infantry battalion by utilizing fire and maneuver, mobility, armor protected firepower and shock action to close with and destroy the enemy, his fortifications and material. For CAX purposes the minimum participation level has been established as one company of tanks (17 tanks).

(5) LVTP/LVTC Support - The primary mission of the amphibian vehicles is to transport assault elements to inland objectives in a single lift, to provide support to mechanized operations, and to provide combat support for other operational requirements. For CAX purposes the minimum participation level has been established as ten LVTP vehicles and two LVTC vehicles.

(6) Anti-Mechanized Support - The primary mission of this component is to destroy enemy armored weapons and vehicles. The minimum participation level for these weapons has been established as one TOW Section and the Dragons that are organic to the battalion.

2. <u>Air Combat Element</u>

The primary mission of the Air Combat Element (ACE) is to provide close air support to the ground elements. Close air support is defined as the attack of hostile targets that are in such close proximity to friendly forces as to require

detailed integration of each air mission with fire and movement of ground forces. Also, the ACE provides helicopter transport of equipment, supplies, and personnel. The ACE consists of the aircraft and their pilots and the necessary personnel to keep them operating. The desirable aircraft mix to support a CAX, as stated by MCAGCC Order 3500.11, is as follows [13:ENCL(3); P. 3]:

(1) Detachment Marine Attack Squadron or Marine Fighter/Attack Squadron - Four A-4 aircraft <u>or</u> four AV-8 aircraft <u>or</u> four F-4 aircraft.

(2) Detachment Marine Observation Squadron - Three OV-10 aircraft.

(3) Detachment Marine All Weather Attack Squadron - Two A-6 aircraft.

(4) Detachment Marine Heavy Helicopter Squadron - Two CH-53 helicopters.

(5) Detachment Marine Medium Helicopter Squadron - Three CH-46 helicopters.

(6) Detachment Marine Light Helicopter Squadron - Two UH-1 helicopters.

(7) Detachment Marine Attack Helicopter Squadron - Four AH-1 helicopters.

(8) Detachment Marine Tactical Reconnaissance Squadron - Two RF-4B aircraft.

(9) Detachment Headquarters & Maintenance Squadron - This unit performs logistic support and maintenance on assigned aircraft.

(10) Detachment Marine Air Base Squadron - This unit provides airfield facilities and services to include emergency crash crew and freight operations.

(11) Detachment Marine Wing Support Group - This unit provides ground combat service support to air elements.

(12) Detachment Marine Wing Communications Squadron - This unit provides communications for the air command and control system.

(13) Detachment Marine Air Traffic Control Squadron - This unit provides round-the-clock aircraft control within the vicinity of the airfield.

(14) Detachment Marine Air Support Squadron - This unit provides facilities for the control of aircraft operating in close or direct support of ground units and operates a Direct Air Support Center to receive and coordinate requests for air support, including helicopter support.

3. <u>Logistic Support Element</u>

The Logistic Support Element (LSE) provides combat service support to all ground and air elements involved in the CAX. Their logistic capabilities include the following:

(1) Maintenance - LSE performs organizational maintenance on all material and intermediate maintenance on all ground equipment held by ground or air elements, except for aircraft or special aircraft related equipment. The ACE provides maintenance for aircraft and aircraft related equipment.

(2) Medical Support - Medical and Dental support is provided.

(3) Transportation - General transportation support is provided to all elements.

(4) Supply - The LSE maintains a stockage of supplies and provides both general and direct support to all elements.

(5) Explosive Ordnance Support - Explosive ordnance personnel are provided.

(6) Non-Tactical Support - In addition to the tactical units, there are also units from the Combat Center which are involved in the CAXs in a non-tactical role these units provide equipment or service to the participating units. They are:

a. Equipment Allowance Pool (EAP) - The equipment allowance pool maintains a pool of equipment to be used only by units conducting CAXs. This pool contains most of the necessary non-combatant type of equipment, and some combatant types, that are needed to conduct a CAX. The EAP minimizes the amount of equipment that a participating unit must transport to Twentynine Palms. The equipment in the EAP includes trucks, jeeps, 105mm howitzers, bath units, tents, water containers, mess gear, garbage cans, etc.

b. Range Support Company (RSC) - The RSC exists to repair and restore the exercise training area after each CAX is conducted.

c. Communications Support Company (CSC) - The CSC provides communications equipment to the Tactical Exercise Evaluation

Control Group and the exercise force when the demand exceeds the capacity of the EAP.

d. Third Tank Battalion (3rd TK BN) - Third Tank Battalion furnishes the tanks to be used by the participating units during a CAX.

e. Fourth Battalion, Eleventh Marines (4/11) - Fourth Battalion, Eleventh Marines furnishes 155mm howitzers and 175 mm guns to be used by the participating units during a CAX.

f. First Battalion, Fourth Marines (1/4) - First Battalion, Fourth Marines is an infantry battalion and provides troops to act as aggressor forces during a CAX.

g. Tactical Exercise Evaluation Control Group (TEECG) - This unit exists for the sole purpose of evaluating the participating units which conduct the CAXs.

C. TRAINING OBJECTIVES

The type of training to be received by the participating units is set forth in MCAGCC Order 3500.11 which specifies the following primary training objectives [13:2]:

1. To improve effective command and control in the conduct of fire support coordination in combined arms operations to include assets with priority placed on air-ground integration in a mechanized/anti-mechanized warfare environment.

2. To improve the capability for each supporting arm to effectively respond to requests of the supported unit during the conduct of combined arms operations.

3. To improve command, control, and communications capabilities in combined arms operations at all levels by selective exercise of procedures and systems, to include evaluation of new techniques and equipment as directed by the Commandant of the Marine Corps.

4. To improve logistical support of participating units by the LSE.

5. To improve electronic warfare capabilities in combined arms operations in a nuclear, biological, or chemical environment.

Each CAX is evaluated at its conclusion by the TEECG. All aspects of live fire and all units of the exercise are evaluated based upon their ability to accomplish the training objectives. This evaluation is reported by message to the parent command of the participating units, and is also provided via an after-action report.

A CAX consists of the following training events [13:8-9]:

1. Controllers School.

2. Fire Support Coordination Center training for the Exercise Force Staff.

3. Integrated training for attachments.

4. Threat/Safety briefings.

5. Standard Operating Procedures and Operating Ordnance Review.

6. Communications Exercise.

7. Artillery Registration.

8. Live Fire Rehersal and Critique.

9. Combined Arms Evaluated Exercise.

10. Controller Debrief.

11. Informal Critique.

12. Formal Critique.

The number of days required to complete these events varies slightly, but normally takes about 15 days.

Combined arms exercises have been conducted at Twentynine Palms since 1976. However, only recently has it been stated what level an exercise force should be in order to effectively participate in a CAX. MCAGCC Order 3500.11 states that training will be concentrated at the infantry battalion level, and that ten CAXs will be scheduled annually [13:8].

III. PROBLEM CLARIFICATION

A. OVERALL PROBLEM

The overall problem of the CATP is the inability to accurately estimate the cost of a CAX. Resulting from this is the inability to accurately budget for the necessary amount of funds to conduct the ten annual exercises. Since CAXs have been conducted at the Combat Center from 1976, it would seem that the cost of a CAX would be relatively easy to estimate. However, this is not the case. This difficulty in estimating CAX costs warrants further analysis.

Past exercises have been conducted by exercise forces of various sizes which has caused the cost of each CAX to vary. However, within the past year, emphasis has been placed primarily on battalion-sized CAXs. Theoretically, with each battalion conducting the same exercise, with the same combat scenerio and time frame, the cost of each exercise should not vary to any large degree, except for transportation costs of units from different locations. With this thought in mind, MCAGCC has been assigned the task of identifying and reporting CAX costs in order that Headquarters, Marine Corps (HQMC) may insure that funds are available. Unfortunately, this task has not been as simple as was initially perceived. Reported CAX costs have continued to vary significantly as is shown below:

EXERCISE	TOTAL COST
4-80	$ 624,760
5-80	619,265
6-80	918,606
7-80	1,103,029

Why have CAX costs continued to vary so widely? The reason is that "Management Control" has not been established over the CATP. Management control is defined as follows:

> Management control is the process by which managers assure the resources are obtained and used effectively and efficently in the accomplishment of the organization's goals [1:8].

The key words in this definition are effectively and efficiently. Effectiveness is the extent to which an organization produces the intended or expected results. Efficiency is the amount of output per unit of input. An efficient organization is one which produces intended or expected results with the lowest consumption of resources. An organization can be effective without being efficient, or it may be efficient without being effective. However, an organization must be both effective and efficient before it can be said management control has been established.

Most people agree that the CATP has been effective. Unfortunately, the CATP has not accomplished its objectives efficiently. The cost of each CAX has varied because different amounts of resources have been used in each of them. Why does this continue to happen?

In order to answer this question, the concept of "task organization" must be explained. A Table of Equipment (T/E) specifies the types and amounts of equipment that units of various size rate. This T/E, however, is intended for units that are operating independently, and not part of a combined arms unit such as a Marine Amphibious Unit (MAU). A MAU is task organized to accomplish a specific mission and the resources necessary for this mission are determined by the force commander. Such is the case with an exercise force that is to participate in a CAX.

Logistic requirements (equipment, supplies, and personnel) to support the exercise are determined by the participating commands. Exercises have varied significantly in the amount of resources that were estimated to be needed.

In addition to the resource estimation problem, there is also a problem of resource control. No single command has been assigned overall responsibility for control of resources used in a CAX. This lack of centralized control is due mainly to the present cost budgeting system and can very easily lead to inefficient utilization of resources. This problem is discussed in detail in Chapter IV.

Making MCAGCC's job of cost reporting even more difficult is the fact that the present system for separating, identifying, and reporting CAX costs is inadequate. The cost of a CAX is not taken from one command's budget, but from the budget of several

commands in different geographical locations. The process of collecting costs reports from units in different geographical locations can be time consuming. Since this is also related to the issue of centralized control, it too will be discussed in Chapter IV.

The five underlying causes of the inability to accurately estimate CAX costs are restated below:

1. <u>Lack of a Standard Equipment Issue</u>

The types and optimal amounts of equipment needed in order to properly conduct an exercise have not been identified.

2. <u>Lack of Standard Supply Issue</u>

The proper types and amounts of supplies needed to conduct a CAX have not been identified.

3. <u>Lack of a Standard Ammunition Issue</u>

The proper amounts of ammunition needed to conduct a CAX have not been identified.

4. <u>Lack of Centralized Control</u>

No single command has overall responsibility for controlling the resources that are used during a CAX to insure they are used efficiently. This is due mainly to the present CATP budgeting system.

5. <u>Inadequate System for Separating, Identifying, and Reporting CAX Costs</u>

The system by which CAX costs are separated, identified, and reported is inadequate.

The first three of the above causes will be discussed in this chapter. Because the fourth and fifth causes pertain to the CATP budgeting system, they will be discussed in Chapter IV.

B. WHY STANDARDS ARE NECESSARY

The previous section explained that the lack of a standard issue of equipment, supplies, and ammunition has resulted in inaccurate estimates of CAX costs. When these items are ordered in excess they are charged as a cost of the CAX even though some of them were not used during the CAX. Therefore, CAX costs are higher than they should be.

Because material is such a large cost item in most programs, material control is a very important factor. "Material control is simply providing the required quantity of material at the required time and place. By implication, material secured must not be excessive in amount and it must be fully accounted for and used as intended." [10:124]. Proper accounting for and control of materials will reduce waste and will provide for more accurate cost reporting.

How should a manager attempt to control the cost of resources used? The most basic approach is through the use of standards. "A standard may be defined as a benchmark for measuring achievement." [9:282]. In relation to resources, it represents a level of usage that should be attained, and is the basis for measuring the adequacy of actual resource usage.

Standards are set for both quantity and price. Quantity standards say how much should be used and price standards are estimates of the amount that will be paid for one unit issue of the resource. Standard price multiplied by the standard quantity will give a standard cost for a resource. This standard cost figure can then be used in planning the cost of future periods. If actual cost exceeds standard cost, management may then direct their attention to the difference determining whether or not it is due to a variance from the quantity standard, or a variance from the price standard. An unfavorable price variance indicates that the price of the resource being measured is higher than was originally estimated. Actual resource price is usually uncontrollable; therefore, if the excess cost is due to an unfavorable price variance, this does not mean that resources have been utilized inefficiently. However, an unfavorable quantity variance indicates that more of a resource has been used than was originally estimated to be used. If the excess cost is due to an unfavorable quantity variance, resources may have been used inefficiently. If the unfavorable quantity variance is considered to be significant, management should investigate to find out why this variance occurred. This is the advantage of standards. They indicate possible inefficiencies that may be corrected before more resources are wasted.

Past experience is normally the starting point in setting a standard; however, it must be more than just a projection of the past. Due to inefficiencies, past data may be contaminated.

Past data is valuable only if it is helpful in predicting the future. Therefore, quantities used in the past should be adjusted to the amounts that should have been used, and past prices should be adjusted to reflect what they are expected to be in future periods. Standards must always be reflective of what they should be, not just what they have been.

The standard that is set should be practical. That is, it should be an attainable standard that allows for normal variances. Naturally no manager wants to use more resources than is necessary, but trying to reduce resource waste by setting an unrealistically tight quantity standard could discourage those who must work under the standard. Also, variances from such a standard would have little meaning because they would include normal inefficiencies, not just abnormal inefficiencies that management wants to isolate.

Perfection is impossible. Therefore, variances from a standard should be expected within a certain range. Any variance falling within this range should be considered as a normal variance; however, any variance falling outside this range should be considered abnormal and should be investigated.

In addition to signalling abnormal deviations, standards can also be used in planning the amount of resources necessary for future operations. The standard, being the best estimate of the amount of recources that should be used for a certain operation or time period, can be multiplied by the number of times that operation or time period will occur during the budget period.

This will result in the most reliable estimate of the amount of resources that will be necessary and this amount can be planned for in the budget. One may question the accuracy of this estimate because, as was stated earlier, variances from the standard should be expected. One should remember, however, that there will be favorable as well as unfavorable variances, and they should tend to offset each other. Suppose, for example, that for a certain operation the standard amount of fuel has been set at 100 gallons, and normal variance is considered to be 20 percent from standard. Suppose also, that ten such operations will be conducted annually. The control chart below could be used to measure the efficiency of any one of these operations, and also the combined efficiency of all ten operations:

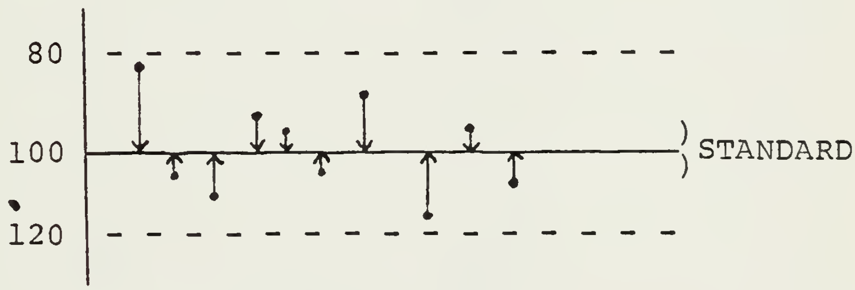


EXHIBIT 3-1. Control Chart Showing Normal Variance

The solid line represents the standard amount of fuel usage. The broken lines represent the upper and lower limits for what is considered to be normal variance. The dots represent the amount of fuel that was used for each of the ten operations; and the

arrows represent the variance, favorable or unfavorable, from the standard. From this chart one can readily see that each dot falls within the normal variance range indicating each operation was controlled fairly well, although some were more efficient than others. The combined efficiency of all ten operations may be measured as in the following example:

100 x 10 = 1000 gallons (standard amount for 10 operations)

Assume actual amounts as follows:

Operation		Gallons Consumed
1		87
2		107
3		112
4		93
5		98
6		106
7		89
8		118
9		96
10		105
	TOTAL	1011

The annual results indicate an unfavorable variance of eleven gallons, which is only 1.1 percent from the standard. This is certainly close to standard and management should be pleased since a 20 percent variance (in this example) is considered normal. Management, as used here and throughout the chapter, refers

to whoever has been assigned overall responsibility for efficiency of a program.

The case just presented was hypothetical, but fully illustrates how standards should be used. One should not assume, as some do, that the standard should be set at the average amount that has been used in the past. The fact that the standard should be set at the amount that should have been used in the past, or if operations are going to be modified in some way, the amount that management believes should be used in the future, cannot be overstressed. This may or may not be equal to the average amount used in the past. Of course, the upper and lower limits establishing the range for normal variance may be set as narrow or wide as management feels is appropriate. The important thing is that they are realistic. If they are too narrow, they will exclude normal variances. If they are too wide, they will include abnormal variances. Judgment must be exercised when establishing these limits. If past data can be adjusted to reflect an estimate of what should have been used, this may help in deciding where these boundaries should be set. However, they may always be changed when results indicate thet are too narrow or too wide. The important thing is that they are set so that a starting point will have been established. Once management is satisfied that actual results accurately reflect the amount of resources that should have been used, then the average amount used should be a fairly reliable standard. The range of normal variance could then be established as a certain number of standard

deviations from the average. Standard deviation is a statistical measure of the dispersion or scattering of the observations about the average.

Consider again the hypothetical example that was presented earlier. Suppose that the fourth operation has been completed and the fuel used for the four operations is as shown on the chart in EXHIBIT 3-2 below:

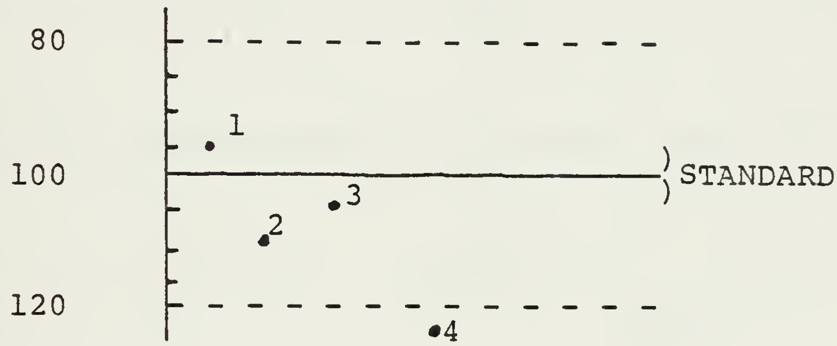


EXHIBIT 3-2. Control Chart Signalling an Operation Out of Control.

Notice that the first three operations fell within the normal variance range, but the fourth one fell outside this range on the unfavorable side. It shows an abnormal variance that is unfavorable because more than 120 gallons of fuel were used. This should be a warning signal for management. Something is wrong because this operation was out of control. Management should investigate and correct whatever is causing this inefficiency prior to beginning the next operation, if possible. This will prevent further waste of fuel and should bring the variance back within the normal range. This is one of the

primary advantages of using standards. They expedite the identification and correction of possible inefficiencies.

Now consider the situation in which fuel consumption for each operation falls on the same side of the standard. That is, when charted most of the dots appear on the favorable side of the standard, or most of them appear on the unfavorable side, as shown in EXHIBIT 3-3 below:

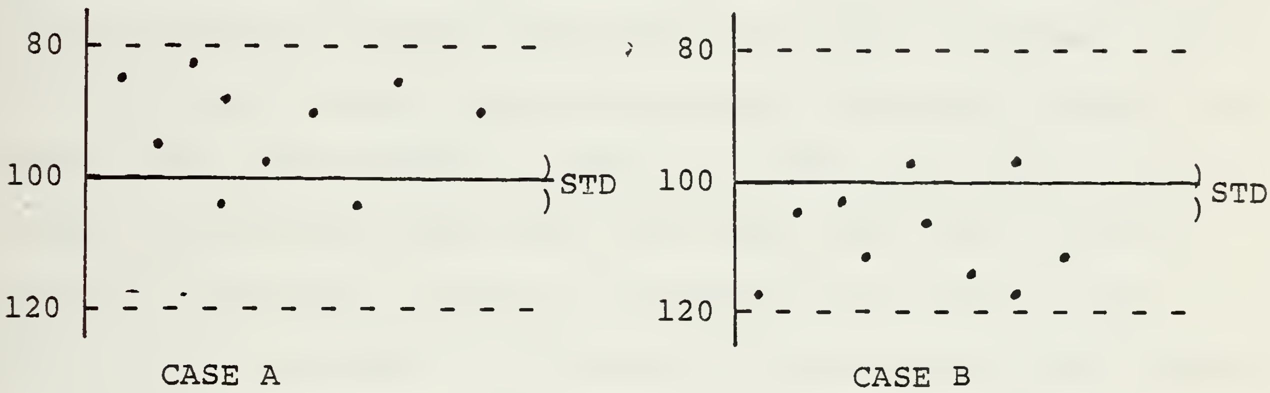


EXHIBIT 3-3. Control Chart Signalling the Possibility of Inaccurate Standards.

When the standard is set correctly, the dots should fall almost evenly on each side of the standard. When a disproportionate number of dots fall on either side of the standard, it is an indication that perhaps the standard has been set too high or too low. In Case A, the standard appears to have been set too high. The normal amount of fuel usage for an operation is somewhat less than management had estimated. But this is not a serious problem. By looking at the chart, management can tell approximately where the standard should have been set, and can adjust it accordingly. In this case it appears that a standard

of 90 gallons would have evenly divided the dots. This means that the lower and upper limits should become 70 and 110, respectively, and the one dot which fell below (in the abnormally favorable area) would now be well within the normal variance range.

Case B, however, presents a more serious problem. When a disproportionate number of the dots fall on the unfavorable side of the standard, in this case indicating that the normal amount of fuel usage is more than was estimated, management should not assume that the standard is wrong and adjust it upward accordingly. They should first make sure that fuel usage is being properly controlled. That is, perhaps all the fuel is not being used as intended. For example, if management had intended that fuel for a particular operation be used only for transportating personnel, but discovers that it has also been used to dispose of scrap, resulting in more fuel being used than otherwise would have been, then obviously the problem is not that the standard has been set too low. The problem is that proper controls have not been established to ensure that fuel is properly used. When management is satisfied that fuel usage has been properly controlled, and that the amount reported accurately reflects the amount used is as intended, then they may adjust the standard upward.

A general model for variance analysis that distinguishes between price variances and quantity variance is as follows:

1. (Standard Qty) X (Standard Price) = Standard Cost

2. (Actual Qty) X (Actual Price) = Actual Cost

3. (Actual Qty) X (Standard Price) = Standard Cost for Actual Qty

4. (Standard Cost for Actual Qty) - (Standard Cost) = $ Qty Variance

5. (Actual Cost) - (Standard Cost for Actual Qty) = $ Price Variance

6. Check control chart to see if quantity variance is normal or abnormal in the number of units actually used

Suppose the standard amount of fuel for an operation is set at 100 gallons at a standard price of $1.00 per gallon. However, actual fuel used was 120 gallons at an actual price of $1.25 per gallon. Using the given model, a variance analysis can be performed:

1. (Std Qty) x (Std Price) = Standard Cost
   100 x $1.00 = $100

2. (Act Qty) x (Act Price) = Actual Cost
   120 x $1.25 = $150

The total variance between standard cost and actual cost is $50. This figure should now be broken down to identify how much can be attributed to the variance in the number of gallons used, and how much can be attributed to the variance in price:

3. (Act Qty) x (Std Price) = Std Cost for Actual Qty
   120 x $1.00 = $120

4. (Std Cost for Act Qty) - (Std Cost) = $Qty Variance
   $120 - $100 = $20

5. (Act Cost) - (Std Cost for Act Qty) = $Price Variance
   $150 - $120 = $30

So in this example $20 of the total variance is due to a quantity variance, and $30 is due to a price variance. Therefore, $30 of the $50 difference is beyond management's control and has no bearing on whether or not resources were used efficiently. To know whether or not the $20 unfavorable quantity variance indicates inefficiency, management must look at their control chart and see if the 20 gallon variance in fuel usage is normal or abnormal according to the normal variance range that has been established. Of course, this may be done without calculating steps one through five. These steps are usually desirable, however, because the impact of efficiency or inefficiency is better felt when it is also reported in dollar terms.

One immediate thought which comes to mind is that this could not be done for each resource that is used. To do so would be impractical. However, it is only necessary to do it for resources that are critical in cost. Perhaps three or four resources account for 90 percent of resource cost.

Standards, in and of themselves, do not ensure efficient use of resources. Although they may assist in this effort by giving managers a goal to achieve in the amount of resources used, their primary purpose is to compare actual usage to the standard thereby providing a signal for when resources are possibly not being used efficiently. Resource efficiency can only be attained by providing incentives and controls which ensure that

resources are used properly. When this has been done standards become useful in maintaining this control and in planning resource usage for future operations. However, it is difficult to operate efficiently on a continuing basis without both controls and standards. As explained earlier, standards without controls may allow misuse of resources, however, even when controls have been established, it is difficult to measure whether or not they are working if no standards have been set. Therefore, without standards management may not know when resource usage is not being controlled. They will see fluctuations in the amounts used, but will have no basis for knowing when these variations are normal or abnormal. Therefore, controls and standards complement each other. When management is satisfied that adequate controls have been established, they may concentrate on the standard control chart to signal when operations are out of control or the standard needs adjusting.

The following advantages can be cited in favor of using standards:

1. Standards make possible "Management by Exception" - So long as costs or resources usage remains within the normal variance range, no attention by management is needed. When they fall outside this range, then the matter is brought to the attention of management at once as an "exception." "Management by Exception" makes possible more productive use of management time [9:284].

2. Standards facilitate planning the budget - Standard quantity times standard price gives the standard cost of a resource for an operation. This standard cost is the most reliable estimate of how much money will be needed to finance that resource for every such operation that is performed in the next budget period.

3. Standards promote economy and efficiency - So long as standards are set on a practical basis, they promote economy and efficiency in that those working under the standard tend to apply a more conscious effort toward being efficient.

4. Standards provide a quantifiable measure of efficiency that would otherwise not be provided.

5. Standards expedite the identifying and correcting of inefficiencies before more resources are wasted.

C. NECESSITY FOR A STANDARD EQUIPMENT ISSUE

MCAGCC maintains most of the equipment necessary to conduct a CAX, excluding aircraft and special aircraft related equipment. This includes artillery, tanks, amphibious vehicles (LVTPs), trucks, jeeps, communications gear, water trailers, etc.; and smaller items such as tents, garbage cans, mess equipment, etc. However, since the exercise force is task organized, the participating commands determine the amount of equipment that will be used. If the amount of equipment they desire is not available from MCAGCC, the additional amounts may be transported to the Combat Center with the participating unit. This can

create additional transportation costs and cause maintenance costs to vary. Appendix A-2 shows the types and amounts of ground equipment that were requested for use in past battalion size CAXs. One can readily see that amounts of some items of equipment have varied significantly while others have not. The numbers of the various types of aircraft used in these CAXs were not obtained.

To date there has been no maximum limitation established for the amount of equipment that will be used in a CAX. MCAGCC Order 3500.11 does establish minimum levels for certain items, but it does not establish upper limits. There must be a point at which the additional benefit of using one more piece of a certain item of equipment does not warrant the additional cost of using it. This point is difficult to find because there is no standard unit of measure for the benefit received from using equipment as there is for the additional cost. Therefore, the decision as to when this point has been reached is more of a subjective decision than an objective one. However, a subjective decision establishing this point would be better than no decision at all. For without it, the cost of operating and maintaining the equipment used in the CATP can never be accurately estimated and budgeted for.

Realizing that from a tactical viewpoint a commander may wish to be equipped as heavily as he feels is feasible, in a peacetime environment when the Marine Corps is restricted to a

budget, certain limitations must be drawn. Until a standard issue of equipment is developed for the CAXs, the cost of conducting each CAX will continue to vary.

D. NECESSITY FOR A STANDARD SUPPLY ISSUE

Just as the participating commands determine for themselves the amount of equipment to be used during a CAX, they also determine for themselves the types and amounts of supplies to be used. For past CAXs, the amount of supplies estimated to be needed has varied significantly.

The participating command submits in advance to MCAGCC the supplies desired for the CAX, and MCAGCC furnishes the amounts requested. However, MCAGCC does not pay for these supplies. The participating unit purchases them from MCAGCC's Direct Support Stock Center (DSSC). Therefore, the cost of these supplies are attributed to the budget of the participating command, and MCAGCC has no control over the amounts which are purchased.

In the last ten battalion-size CAXs, over 147 different types of consumable supply items have been ordered in various quantities. When an item is ordered in excess, the participating unit usually can receive only partial credit for returning them to the DSSC. The DSSC maintains a reorder point for each supply item. If they are below this reorder point, they may repurchase excess supplies up to it, but not beyond. However, the DSSC is normally already at, or not far below, its reorder point for most items at any given time. So the amount of supplies that is

repurchased is minimal. Supplies in excess of the reorder point may be accepted free of charge, but they are seldom turned in. Since the participating units do not receive credit for returning these supplies, they usually do not bother with the additional time and work of doing so. Instead,these supplies are given away to other units or transported back to the units parent command to be used at a later date. Personnel interviewed at MCAGCC also indicated that supplies are often found lying in the desert.

There is no way to determine the actual amounts of supplies that were used in past CAXs as records of this have not been kept. Most of the supplies purchased are charged as a CAX cost whether or not they were actually used in conducting the CAX, because they are expensed at the time of issue rather than at the time of consumption. Appendix A-6 shows the types and quantities of some supplies that were ordered for past battalion-size CAXs. Appendix A-7 shows the cost of these same supplies. From Appendix A-6 one can readily see the wide variance in the quantity ordered for many of the supply items. Where two CAXs are listed together the quantities given are the combined quantities for the two CAXs. These CAXs were conducted back-to-back and the supplies purchased were for both of them. This fact must be kept in mind when comparing these columns to other columns.

In order to minimize waste and preclude excess supplies from being charged as a CAX cost, a standard supply issue should be developed which will be issued to each unit that undergoes CAX training. This does not mean that if more supplies are needed that they cannot be drawn. However, it does mean that an appropriate amount of supplies to be used in a CAX will have been established; and if actual usage varies significantly from this standard, the reason can be investigated and corrections made if necessary. Until a standard issue of supplies is developed, the cost of conducting CAXs will continue to vary significantly.

E. NECESSITY FOR A STANDARD AMMUNITION ISSUE

Just as the participating commands determine for themselves the amount of supplies and equipment, they also determine the types and amounts of ammunition that will be used. Ammunition expenditure reports from past CAXs reveal that ammunition usage for each CAX has varied significantly. Ammunition is very expensive; therefore, when the amount of ammunition expended varies significantly from one CAX to the next, the costs of each CAX also varies significantly.

Appendix A-13 shows the various types and amounts of ammunition that were expended by type of weapon for nine CAXs. Expenditure reports for CAX 4-79 were not available. Column one indicates the type of ammunition by Department of Defense Identification Code (DODIC). Columns two through ten identify

the number of rounds that were reported as being expended for each type of ammunition in each CAX. One can readily see the wide variances in ammunition usage in the various CAXs.

One problem with these past CAX ammunition expenditure reports is that they may not accurately reflect the amounts of ammunition actually expended during the CAX. At the conclusion of each CAX, excess ammunition is sometimes used for additional target practice by the participating units, and charged as rounds expended during the CAX. This distorts the true amount of ammunition for that CAX. This study does not question the validity of using excess ammunition for additional practice, but simply points out that this ammunition should not be reported as ammunition expended during the CAX. There is no way to determine how much excess ammunition used in this manner was charged to each CAX.

A standard issue of ammunition would help to eliminate the problem stated above as it would minimize the amount of excess ammunition left over after each CAX. If additional target practice is desired, more ammunition could be drawn after the number of rounds actually needed for the CAX has been determined.

Presently, ammunition expended during a CAX is not reported as a cost of the CAX. The reason is that ammunition is paid for by HQMC who then gives ammunition allotments to various commands. Therefore, the participating commands do not consider ammunition to be a CAX expense since it is not deducted from their operating

budget. The participating commands are correct in saying that ammunition is not an expense to them; however, ammunition is a direct expense to the Marine Corps, and to say it is not a CAX cost is incorrect. Which pot of money pays for the ammunition is irrelevant. The important point is that ammunition is purchased and then used to conduct CAXs; therefore, ammunition expended during a CAX should be accurately recorded and reported as a CAX cost.

F. SUMMARY

This chapter stated the overall problem associated with the CATP and the five underlying causes of this problem. The first three of these causes, which dealt with standard issues of equipment, supplies, and ammunition were discussed. In addition, a general discussion of why standards are necessary and how they should be used, was provided.

Chapter IV addresses the fourth and fifth causes of the problem. They are discussed in a separate chapter because they are directly related to the present CATP budgeting system.

IV. BEHAVIORIAL IMPLICATIONS OF THE PRESENT BUDGETING SYSTEM

A. GENERAL DISCUSSION OF BUDGETING SYSTEMS

Chapter III addressed the problem of controlling the resources used in a CAX. This problem is a result of no command having overall responsibility for controlling the quantity of resources ordered for use during a CAX or their efficient use thereafter. Instead, separate commands, through their several participating units, are responsible for controlling only a portion of the resources utilized. The presumption is that if each unit operates efficiently, the CATP will also be conducted efficiently. This misconception has probably contributed to the failure of many organizations, in both the private and public sectors. The various entities within an organization seldom, if ever, exist in isolation. On the contrary, the mission and work performed by each entity should be complementary in order that the common goal of overall betterment of the organization will be achieved. However, it is very easy for managers of these separate entities to lose sight of this common goal because they are held responsible for only the operations of the entity which they manage. As a result, these entities tend to view themselves as separate organizations, operating independently of one another, rather than viewing themselves as complementing units of the organization in which they are a member.

For any program within an organization, there must be someone who is responsible for the overall success of the program.

It is the responsibility of this central figure to coordinate and direct the efforts of each entity or unity involved. When there is nobody with this overall responsibility, the entities will tend to act as individuals, causing inefficiency.

Such is the case with the CATP. Headquarters Marine Corps (HQMC) has not assigned to any one command the overall responsibility for ensuring that the CATP is conducted efficiently. The Commanding General, Marine Corps Air Ground Combat Center (CG, MCAGCC), is tasked to provide combined arms training aboard the combat center. However, due to the command relationships and the budgeting and accounting system of the CATP, the CG, MCAGCC, does not control the resources used in the CAXs.

Even if overall responsibility for a program has been assigned, there is no assurance that the program will be conducted efficiently. There may be various reasons for this. One, of course, is that the individual, or manager who has been given the responsibility is incompetent. Assuming he or she is not incompetent, the reason can usually be traced to the budgeting system that exists within the organization. Normally each department/unit within an organization receives an operating budget and each department/unit manager is responsible for the funds his department receives and for the efficient utilization of the resources purchased with those funds. Rarely does a department/unit participate in a program in isolation. Normally, several departments/units are involved. Often when a program is initiated, each unit is furnished, through their budget, the funds they will needs to purchase the necessary resources to

participate in the program. Therefore, each participating unit is responsible for controlling only a portion of the money and resources which support the program. Authority for how the program's money and resources are utilized is divided among the several participating units. Consequently, program efficiency is difficult to achieve. The budgeting system itself is fostering an attitude that organizational unity will exist if each department/unit manager is concerned only with his or her own entity. While this concern is necessary, it is also necessary that these subordinate managers be fiscally responsible to an overall program manager.

Having overall responsibility for a program does not ensure success regardless of the competency of the manager. An individual cannot successfully conduct a program efficiently unless he has the authority to control the money and resources that are used to conduct the program. Responsibility and authority go hand in hand and cannot be separated. Assigning overall responsibility for a program's efficiency to an individual without granting the authority to allocate resources for the program support is dysfunctional. Unless the budgeting system is structured so that the indiviudal responsible for program performance also has authority to control its resources, the entities will tend to operate independently. They will continue to be concerned only with their own unit's effectiveness paying little attention to the functioning of other units.

Essentially, two requisites are necessary before a program can be conducted efficiently:

1. Overall responsibility for the program must be given to one individual who will act as a team captain, coordinating the work of all participating departments/units, insuring their work is complementary thereby leading to overall program efficiency.

2. The program budgeting system must place control of the money and resources that support the program in the hands of the team captain, giving him the authority to utilize the money and resources as he deems appropriate, considering operational requirements.

B. PRESENT CATP BUDGETING SYSTEM

EXHIBIT 4-1 illustrates the flow of funds that are involved in the CATP. CAX participation and CAX support costs determine the flow of funds. For CAX support costs, funds flow from the SECNAV to HQMC via an allocation. The two supporting units, MCAGCC and FMFPAC receive operating budgets. FMFPAC in turn passes planning estimates (PE) to the First Service Support Group (FSSG), First Marine Division (1st MAR DIV), and the Combined Arms Command (CAC).

For CAX participation costs, funds are passed from SECNAV through HQMC to FMFPAC and FMFLANT, who in turn pass funds to the participating divisions and wings. In addition to Marine Corps funded support, Operations and Maintenance, Marine Corps (O&M, MC), from FMFPAC/FMFLANT to their respective air wings, the majority of funds for aviation support, Operations and Maintenance (O&M, N), is passed from CNO to FMFLANT/FMFPAC Commanders via Commander in Chief Atlantic/Pacific Fleet.

Of the commanders shown in the flow of funds diagram, only

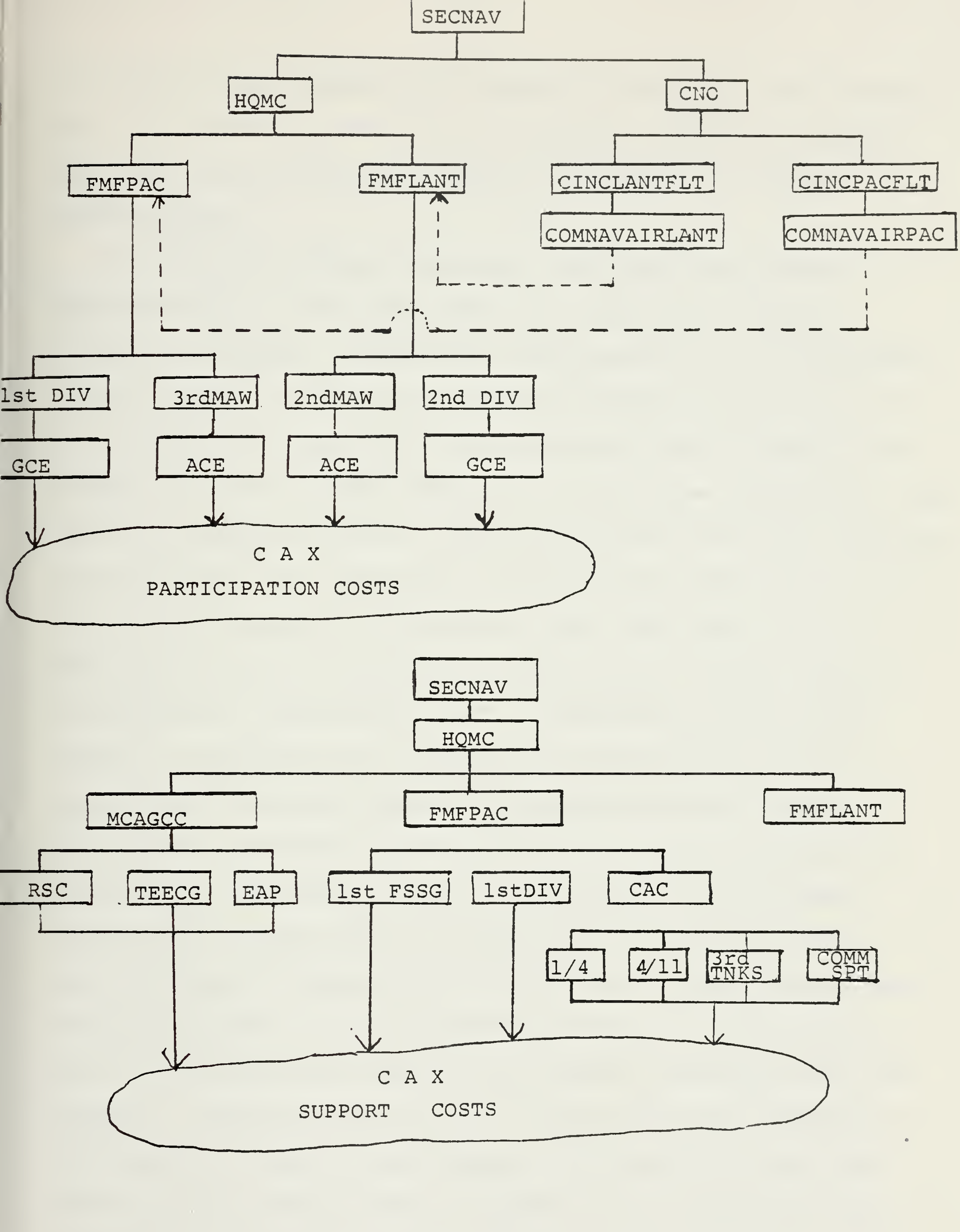


EXHIBIT 4-1. CAX Funding Flow.

the Marine Corps Commands are involved in the CATP. Navy involvement is limited to passing O&M,N dollars to FMFPAC and FMFLANT. How these O&M,N dollars are spent is determined by CMC and FMFLANT/FMFPAC.

Ten CAXs are conducted annually. All non-reserve units participating in a CAX fall under the cognizance of FMFPAC, FMFLANT, and MCAGCC (reserve unit participation is not considered in this study). Each of the commands receive a budget from which they finance their portion of the resources used to support their respective units in CAXs. Therefore, these three commands not only share the responsibility for the CATP, but also share the authority to control how their individual portion of the CATP resources are used. The Commandant of the Marine Corps (CMC) does not act as the team captain for coordinating the efforts of these commands in efficiently conducting the CATP. Headquarters Marine Corps (HQMC) is responsible for planning and administering all programs within the Marine Corps, but program execution depends on subordinate commanders. HQMC only affects program execution by deciding how responsibility for the program will be assigned (individual or team captain concept) and by establishing the type of budgeting system that will be used to support the program (separate budgets for each command involved as is currently the case, or a centralized budget to the command responsible for the program). However, these are the two most important decisions to be rendered in regard to any program. As stated earlier, two situations are required before a program can be conducted efficiently.

1. Overall responsibility for the program must be given to one individual who will act as team captain coordinating the work of all program participants, insuring their work is complementary, thereby leading to overall program efficiency.

2. A budget system which places control of the money and resources that support the program in the hands of the team captain giving him the authority to utilize the resources as he deems appropriate after considering operational requirements.

The Marine Corps has not yet adopted this program responsibility and budget system philosophy for the CATP. The program presently operates under the individual responsibility and separate budget concept, which can lead to inefficient resource utilization.

This individual CATP budgeting system has already lead to inefficient utilization, although the actual degree cannot be determined, due to resource and cost accounting methods employed. This information cannot be retrieved. Recall from Chapter III that excess CAX supplies are not turned in to the Direct Support Stock Control (DSSC) because the participating units do not receive credit for them. Therefore, excess supplies are charged as a cost of the CAX even though they were not used during the CAX. This inefficient utilization resources distorts the true cost of the CAX.

Another illustration of this inefficiency deals with the ammunition used during a CAX. The participating commands do not use money from their budget to purchase ammunition. Instead, HQMC purchases all ammunition for the Marine Corps and issues each command ammunition allotments. Prior to a CAX the participating

command submits to MCAGCC the amount of ammunition they wish to be provided for the exercise. This requested amount is ordered by MCAGCC and staged at the Combat Center until utilized by the participating unit. When a CAX is concluded, excess ammunition is often used for additional target practice and charged as being expended during the CAX. If this ammunition was turned in, it would reduce the amount of ammunition needed to be ordered for subsequent CAXs. However, whether it is turned in or not, it should not be charged as being expended during the CAX if it was not used in the CAX.

The purpose of this section has been to point out the behavorial aspects of budgeting systems and to relate them to the CATP's budgeting system. Summarizing, two different budgeting system philosophies were identified:

1. Individual Responsibility and Separate Budget Concept - This philosophy holds that if every supervisor is concerned with his or her own department there will be no "trouble in the plant." Therefore, if each supervisor is made primarily responsible for the budget, the necessary funds to carry out this responsibility, no problems will arise [3:105].

2. Central Control and Budget Concept - This philosophy holds that responsibility and funding for a program should be centralized. That is, one individual or command should be held responsible for the program and his budget should include all money that will be used to finance the program. This individual may then direct and coordinate the efforts of all participating units, insuring that they act as teammates by complementing each other in efficiently

executing the program.

At first glance the first philisophy seems logical; however, it overlooks a very important point:

> "An organization is something different from the sum of the individual parts. The parts of an organization exist in certain relationships with each other, and it is these relationships that create the difference. One cannot conceive of "adding" together the parts of an organization anymore than adding together the hundreds of pieces that make up a watch in order to make it run. The crucial problem is to place the parts in correct relationship to each other." [3:105].

If everyone does his utmost to make certain that his own department is functioning correctly, but at the same time pays no attention to the functioning of his department in relation to others, problems will arise.

In order for a program to be conducted efficiently, centralized control and budgeting is a necessity.

C. CENTRALIZED CONTROL AND BUDGETING SYSTEM

As stated in the previous chapter, MCAGCC has been assigned the task of identifying and reporting CAX costs. Accomplishing this, however has proven to be difficult because the present system for separating, identifying and reporting CAX costs is inadequate. Some data simply cannot be retrieved. Again, the underlying cause of this program can be traced to the CATP budgeting system. Because MCAGCC incurs only part of the cost associated with the CATP, they do not have all cost information readily available. They must rely on other commands to compile this information and forward it to them, which makes cost reporting less timely. Each command must determine and compile its own

cost and then mail them to MCAGCC, who in turn combines the cost of each command and sends the combined report to HQMC. Sixty days are allowed for this process. By the time this information has been compiled two more CAXs may have been conducted.

Timeliness is probably the most important consideration when establishing any cost collection and reporting system. The sooner the information is obtained, the sooner it may be used to influence operations. A report that is received too late to influence future operations, from the standpoint of correcting inefficiencies in a timely manner, is worthless. If certain costs in one CAX seems excessive, they can be monitored in the subsequent CAXs to determine if resources are being utilized inefficiently.

The present CAX cost reports would be more valuable if they could be received in time to influence CAXs scheduled to be conducted in the very near future, rather than just those scheduled several months in the future. One contributing factor is the 30 day POST-CAX maintenance period in which maintenance of equipment is chargeable to that respective CAX. Even though the present system requires this cost data to be reported to MCAGCC; there exists the problem of accurately identifying, separating, and reporting CAX cost. Until one command has control of and responsibility for the entire CATP budget, thereby centralizing all cost information, this problem will persist. It is difficult to separate the reporting function from the accounting function. If a unit is to be held responsible for reporting costs, that same unit should account for those costs. Otherwise, that unit should not be held responsible for inaccurate or untimely reports.

Obviously, there is a purpose for which these cost reports are intended to be used. One possible reason, as previously addressed, is to spot and correct possible inefficient use of resources. However, due to the untimeliness of the present reporting system and the fact that excess supplies are being charged as a CAX cost, it is questionable whether these reports are being used for that purpose. Recent changes to the cost reporting requirements initiated by MCAGCC is a positive step toward improved accounting for CAX costs. However, inputs for these reports are often contaminated or at times undeterminable. For example, FMFPAC and FMFLANT report aircraft flight time in support of the GCE, but FMFLANT includes aircraft transit time to and from the East Coast. This inflates the CAX cost by 400 percent to 500 percent in some ACE costs attributable to the CAX. Due to the fact that other training is also conducted during this transit time, the total cost of this flight time should not be totally attributed to the CAX.

One other possible use of these reports is to plan the budget for future operations. However, if the annual budget for the CATP is based on the cost reports of previous exercises, then there is an assumption that these reports accurately reflect what a CAX should cost. The fact is they do not. Because these reports reflect cost of excess supplies that were never consumed in a CAX, they do not accurately reflect what the cost of a CAX should be. If HQMC plans their budget on these cost reports, they they are budgeting for this inefficiency.

Before the costs reports can be replied upon for budgeting

purposes these inefficiencies must be eliminated, but will not be as long as the present individual control and separate budgeting system for the CATP exists. To be made reliable they must be timely and accurate, neither of which will be realized until a centralized control and budgeting system has been adopted.

D. SUMMARY

Chapter III addressed the overall problem of the CATP as the inability to accurately estimate the cost of a CAX. Five underlying causes were identified. In this chapter two of these causes were discussed:

1. Lack of decentralized responsibility and control.

2. Inadequate system for separating, identifying, and reporting CAX costs.

The chapter further stated that both of these causes could be traced to the present CATP budgeting system which is based on an individual responsibility and separate budget concept, and that efficiency will not be attained nor will cost reports be timely and accurate, until a centralized control and budgeting system has been established.

This chapter dealt mainly with the disadvantages of an individual responsibility and separate budgeting system as they relate to the CATP. In Chapter V the advantages of a centralized control and budgeting system for the CATP will be addressed.

V. ADVANTAGES OF A CENTRALIZED CONTROL AND BUDGETING SYSTEM

A. SYSTEM DEFINITION

In Chapter IV, the disadvantages of an "individual responsibility and separate budget" concept were discussed along with the statement that a "centralized control and budgeting system" is necessary for efficient utilization of resources. One should not misconstrue this to mean the proposed system runs counter to the long and widely held "principle of decentralization" to which the military services have adhered for many years. It is the type of decentralization which this chapter addresses.

Decentralization within a command is necessary. The Management Improvement Handbook, prepared for Marine Corps activities, reads as follows:

> To the greatest extent practical, authority and responsibility for action should be decentralized to the subordinate units and individuals responsible for actual performance of operations. This principle is designed to place in the hands of those closest to actual operations the authority and responsibility necessary for the complete conduct of those operations. Adherence to the principle will greatly reduce the administrative burden of higher level officials, and will contribute to high morale within an organization. The commander of a unit will be able to exercise executive control through attention to policy matters [20:21].

The above statements refer to authority and responsibility "within" a command. Although a commander does delegate authority and responsibility for performance of operations to units within his command, he still retains overall responsibility for their efficiency and effectiveness. That is, he

still maintains control of and responsibility for the resources that are used within his command. He holds his subordinate unit commanders directly responsible for the efficient utilization of his resources; and if he is not satisfied with their performance, he may take action appropriate to correct the situation. The commander budgets for the necessary resources, and all funds to finance them flow directly to the commander. He then decides how much money each of these units will receive. These units are in turn responsible for the efficient utilization of the money received from the commander. Through this "responsibility accounting" system a decentralized command operates a "centralized control and budgeting system." [2:56, 581].

The problem with the CATP is not that the separate commands involved in the program (FMFPAC/LANT, CAC, and MCAGCC) are decentralized; but rather, as explained in Chapter IV , it is that the responsibility for the CATP, and control of its resources are not centralized within a single command. Instead, this responsibility and control is shared by four separate commands operating under an "individual control and budgeting system" for the program. It is this type of decentralization, decentralizing responsibility for a program between commands vice centralizing it within a single command, with which this study takes exception. The results of this type of decentralization are the inefficiencies that were explained in Chapter IV [11:30,32].

B. JUSTIFICATION AND BENEFITS

If the notion of centralized control and budget responsibility is accepted, the first question to be resolved is to which of the participating commands (FMFLANT/FMFPAC/MCAGCC) should this responsibility be given? It should be given to the command that is closer to the actual operations of the program. Since each CAX is conducted at the Combat Center, MCAGCC is in a better position to manage available resources than is FMFLANT or FMFPAC and should be given the responsibility for centralized control and budgeting.

Benefits that would result from centralizing control and budgeting for the CATP with MCAGCC include the following:

1. Better Control of Excess Supplies and Ammunition - Excess supplies would no longer be a "sunk cost" to the participating command for which no credit is received for turning them in. These supplies would now belong to MCAGCC who could require that they be turned back in at the conclusion of each exercise. Since these resources now belong to MCAGCC, it is in their best interest to preclude their being used inefficiently. These excess supplies may then be reissued to the next unit participating in a CAX. MCAGCC could also limit the firing of excess ammunition at the conclusion of each CAX. Excess ammunition could then be returned to storage for use during the next CAX. Frequently the participating unit commanders wish to conduct additional weapons target practice, either prior to

or after the conclusion of the CAX. If additional target practice has been approved, excess ammunition designated for that purpose could be inventoried prior to its firing. This would ensure that only ammunition used during the CAX would be counted as a CAX cost. Of course, one can argue that the participating unit would still have no incentive to ensure that these supplies are utilized efficiently. However, MCAGCC would now be able to exercise their authority to ensure that resources are utilized more efficiently.

One method of creating an incentive for the participating units to more efficiently utilize resources is to have the TEECG evaluate the participating units in the area of resource utilization. This evaluation should not be too difficult once reliable standards for resource usage have been developed. The amount of resources actually used could be compared to the standard to determine if actual usage falls within the normal variance range. This would give the TEECG an idea as to how efficiently resources were utilized. This not only offers an incentive to the participating units to conserve resources, but is also important from a training standpoint. A combat force becomes vulnerable if they experience a shortage of fuel or ammunition. This evaluation would be impractical for each and every item but could be applied to those items that are critical to the unit's ability to operate effectively. This would include items such as fuel, ammunition, radio batteries, etc.

2. Cost Reports Would be More Timely and Accurate - The separating, identifying, and reporting of CAX costs would be expedited. Since all costs of a CAX would be accounted for by MCAGCC, rather than by separate commands compiling their portion of the cost and mailing it to MCAGCC, the 60-day time period for reporting should be reduced significantly. The cost reports would then be received in time to be analyzed before commencement of the next CAX. If actual costs are higher than standard cost, MCAGCC can break this variance down into price variance and quantity variance to see how much of the additional cost is due to an unfavorable quantity variance. For managerial purposes this information would make the cost report much more meaningful. Unfavorable cost variances that are due to higher prices paid for resources than was estimated do not indicate inefficiency because actual price cannot be controlled by the unit. However, unfavorable cost variances due to unfavorable quantity variances indicate possible inefficiencies. Determining this is a simple matter, if proper standards are established. The only thing MCAGCC must do is to check the control chart to see if the variance is within the normal variance range. This information could also be included in the cost report if desired.

Because excess resources would now be accounted for, they would no longer be miscounted as a cost of the CAX. Therefore, the reports would more accurately reflect the actual cost

of a CAX as they would not be contaminated with the cost of excess supplies that were not used.

3. Budgeting Made Simpler - Since the cost reports would now accurately reflect the actual cost of a CAX, they would be more useful in estimating the future cost of these and other exercises. If CAXs are expected to be basically the same in the future as in the past, reports would now be a reliable base from which to start CATP budgeting. That is, these cost reports would now furnish a fairly reliable minimum budget level for the CATP in the next budget period.

Simplication of cost reporting and budgeting would be further enhanced by utilizing only MCAGCC's cost accounting data for the entire CAX cost. With the exception of some minor POST-CAX recovery cost incurred by the participating units, all PRE-, DURING-, and POST-CAX costs could be funded using MCAGCC cost data. In the event a scheduled CAX was cancelled prior to its commencement, the force commanders could be reimbursed through a funds transfer in order that other training could be conducted using the CAX funds. This would give the force commander the flexibility to choose the most appropriate training substitute for the cancelled CAX. This would entail transferring budgeted cost of the CAX minus the COMMON-CAX costs attributable to that CAX. This transfer of funds should in no way be financially detrimental to MCAGCC, since these funds were allotted to MCAGCC for the sole purpose of

training FMF units. This transfer of funds should leave MCAGCC in essentially the same financial position as had the CAX been conducted.

The purpose of centralized budgeting is not to increase MCAGCC's availability of funds, but to improve cost accounting procedures and resource control. Following the same rationale, MCAGCC's ammunition allotment from HQMC for a CAX that is subsequently cancelled should also be transferred to the FMF commander.

4. Benefits To the Marine Corps as an Organization - The Commanding General of the MCAGCC would now be acting as the team captain coordinating the efforts of all participating units in overall program efficiency. As a result, CMC would now be providing combined arms training to these combat units, but would be doing so more efficiently.

C. CONSIDERATIONS AFFECTING ADOPTION

Considering the problems caused by the present CATP resource control and budgeting system, and the benefits that would be gained if a "centralized control and budgeting system" were used, one probably wonders why a "centralized control and budgeting system" has not already been adopted. A centralized system has been considered, but not everybody agrees that it should be adopted. This issue was discussed at the Fifth Annual Planning and Training conference held 19 April 1980. EXHIBIT 5-1 of this chapter summarizes the positions that were

taken on this issue. The following paragraphs discuss issues stated in EXHIBIT 5-1.

Notice that the first paragraph of EXHIBIT 5-1 states that a centralized system is still an unresolved issue. Two opposing positions have been taken:

1. Centralized control and budgeting should be adopted because it would provide better control of the process for identifying and controlling CAX cost and insuring that funds are available.

2. Centralized control and budgeting should not be adopted because it would divest the Force Commander of funds to influece the scope of training. This would violate long standing policy and would have a deleterious effect on readiness.

The first position is the theme which is advocated in this thesis. However, the authors of this thesis disagree with the second position for the reasons stated in the paragraphs that follow. The second position essentially makes three points:

a. The Force Commander would be unable to influence the scope of training because he would lack the funds to do so.

b. Depriving the Force Commander of funds to influence the scope of training would violate long standing policy.

c. Depriving the Force Commander of funds to influence the scope of training would have a deleterious effect on readiness.

FIFTH ANNUAL
Marine Corps Air Ground Combat Center
Planning and Training Conference

AGENDA ITEM 31

Subj: CAX Funding

Conference Position:

The funding alternatives considered were centralized and an OSE funding.

Centralized Funding: Centralized funding is an unresolved issue. The Center position is that centralized funding would provide better control of the process for identifying and controlling CAX cost and insure that funds are available. FMFPAC contends that to divest the Force Commander of funds to influence the scope of training would violate long standing policy and would have a deleterious effect on readiness.

Due to the aforementioned facts, it is the position of the attendees that the system of controlling cost currently in existence remain intact. It is further requested that the concept of centralized CAX funding at MCAGCC be studied by HQMC with inputs provided by the major participants, after the issue concerning command relationships is resolved.

Regardless of which system is chosen, a uniform cost collection and reporting system is required for the purpose of providing feedback to decision-makers so they can measure the consumption of resources against the resources planned to support the CAX program.

The particulars of the cost collection system are contained in the following attachments. It is requested that CMC include the unified cost collection system in MCO 3500.11A.

	Concur	Nonconcur
HQMC	______	________
MCDEC	______	________
FMFPac	______	________
FMFLant	______	________
4thMar Div	______	________
4thMAW	______	________

EXHIBIT 5-1. Centralized Control and Budgeting System

It is true that a centralized system would eliminate CATP funds from the budgets of Force Commanders. However, it would not eliminate their ability to influence the scope of training. Force Commanders would play a major role in determining the scope of a CAX. Centralized control and budgeting would not give MCAGCC total authority over what will or will not be included in a CAX. That is, they alone would not decide what size the participating units should be, and the amounts of equipment that would be needed. MCAGCC, Force Commanders, and representatives from HQMC must decide this at the Annual Planning Conferences. Once the scope of a CAX has been decided MCAGCC would then budget for and provide this level of training for the next fiscal year. The next Annual Planning Conference would then discuss the merits of training that has been provided, and the scope of a CAX could be modified for the next fiscal year if felt appropriate. So Force Commanders would directly influence the scope of training under a "centralized control and budgeting system."

One important point is appropriate at this time. At each Annual Planning Conference the single most important thing that must be kept in mind is the objectives of the CATP. The reason for this is that often objectives are written and then forgotten. When this happens programs may end up accomplishing something totally different than was originally intended, or providing for additional objectives which various participants

personally feel should be included. When this gets out of hand, programs grow year after year until the money being spent annually to support them is much larger than the amount that would be needed to simply accomplish the objectives as originally specified. The primary objective of the CATP is to train participating units how to properly plan, allocate, and coordinate fires from all fire support assets,and to improve the capability of each supporting arm to effectively respond to fire requests in a Combined Arms Operation. When deciding the scope of a CAX this objective must be keptin mind. The necessary amounts and types of weapons and equipment needed in order to effectively accomplish this objective should be identified. When this has been done it need not change significantly unless the objective has been changed. When additional weapons or equipment are requested, the primary consideration should be whether or not these additions would better accomplish the objective. That is, would these additions better train participating units how to plan, allocate, or coordinate fires; or supporting arms units to more effectively respond to fire requests. If they would not, then they should not be added. It is true that the addition of another artillery piece or another attack aircraft would provide more firepower making the exercise more impressive. This may also provide good experience to troops by exposing them to heavier fires. But this would not necessarily provide for better accomplishment of

the specified objective. Keeping the objectives in mind and guarding against unnecessary additions will prevent the CATP from growing, thereby preventing unnecessary costs.

The assertion that a centralized budgeting system would violate long standing policy by divesting Force Commanders of funds to influence the scope of training is, in this case, not an over-riding consideration. The important thing to consider is whether or not force commanders can influence the scope of training without being funded for it. The long standing policy presumes that they cannot. This may be true in most cases, but not for the CATP. As explained previously, force commanders would still play a major role in influencing the scope of CATP training under a centralized budgeting system. They would do so by directly participating in the Annual Planning and Training Conference in which the scope of a CAX would be decided. Their participation would be a major influence in this decision. Once the scope of a CAX has been decided force commanders have little reason to be concerned with CATP funding. The scope of training has been set, and MCAGCC is responsible for seeing that this training is provided.

The fact that MCAGCC is providing the CAX training is the very reason that the long standing policy should not be followed in this case. In most cases force commanders provide training to their own units, and therefore, must be funded for it. But, in the case of the CATP, these units are not receiving training

from their parent command but are receiving it from MCAGCC. As explained earlier, centralizing control of and budgeting for the CATP with MCAGCC is necessary to ensure that CATP resources are used efficiently. This is difficult if the long standing policy is followed. It has been followed in the past and has resulted in inefficient use of resources and cost reports that were neither timely nor accurate. No policy should be followed when doing so works to the detriment of the Marine Corps.

Centralizing control of and budgeting for the CATP with MCAGCC should not have a deleterious effect on readiness. As stated earlier, the scope of the training to be provided will be decided by the participating commanders at the Annual Planning Conferences. Under a centralized system resources should be more efficiently utilized, cost reports should be more timely and accurate, and budgeting for the CATP should be simpler and more accurate. As long as MCAGCC is adequately providing the CAX training, readiness should not be effected. Since MCAGCC will be providing the training regardless of which budgeting system is used, the type of budgeting system should have little effect on readiness.

Paragraph two of Exhibit 5-1 states that the present system of controlling cost will be continued until the issue as to whether or not force commanders should be funded for the CATP is resolved. This is to say that they will continue to be funded until it is resolved that they should not be, because the

present system of controlling cost is one which follows the individual responsibility and separate budget concept. The inadequacies of this system have already been explained. These inadequacies will continue until this issue is resolved in favor of a "centralized control and budgeting system."

Paragraph three of EXHIBIT 5-1 states that regardless of which budgeting system is chosen, a uniform cost collection and reporting system is required so that actual resource consumption can be measured against planned resource consumption. However, to reiterate, any cost collection and reporting system under an individual control and separate budget concept will be untimely. Therefore, even if it does identify possible inefficient resource useage the information will be received too late to correct the situation before additional resources are wasted. The present system allows 60 days for participating commands to compile their cost and submit them to MCAGCC. By the time they are received, two more CAXs may have already been conducted with subsequent ones far along in the planning phase. In order for the reports to be timely, a centralized system is necessary.

D. FUNDS FLOW

In Chapter IV it was explained how funds to finance the CATP flow to the different commands, under the present budgeting system. This flow is illustrated in EXHIBIT 5-2. The broken lines represent funds that are given to the Marine Corps from the Navy. These funds are known as "blue dollars" while

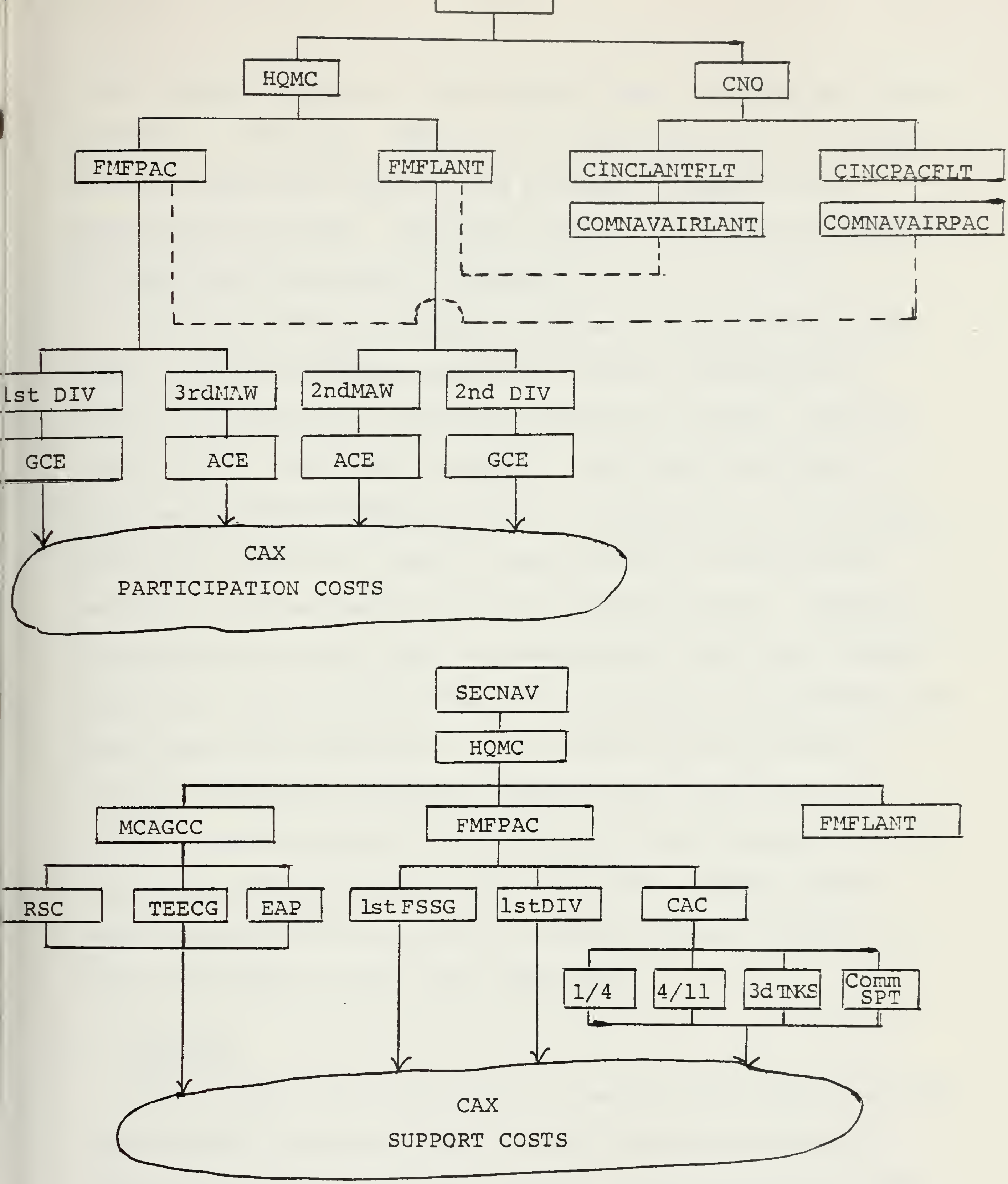


EXHIBIT 5-2. CAX Funding Flow.

funds flowing directly to the Marine Corps are known as "green dollars." The O&M,N dollars are to be used only by Marine Aircraft Wings and only for the purpose of operating and maintaining aircraft. Therefore, O&M,N dollars must always be separated from O&M,MC dollars.

If the centralized budgeting system were adopted for the CATP, the flow of funds would be as shown in EXHIBIT 5-3. Notice that under this budgeting system all O&M,MC dollars flow directly from HQMC to MCAGCC. The only CATP funds received by FMFPAC/LANT are O&M,N to support their aircraft during the exercise. O&M,N money cannot be centralized because it can be used only by the aircraft wings. However, the majority of CATP funds are centralized under this system which will lead to more efficient utilization of resources and more timely cost reporting. Cost reports should be more accurate under this system as MCAGCC would now be able to collect excess supplies and ammunition thereby preventing them from being attributed as a cost of the CAX. These excess supplies could then be used in a future CAX and charged as a cost to the CAX in which they were used.

E. SUMMARY

This chapter has explained that centralized control of and budgeting for resources does not mean decentralization of responsibility and authority within a command should be eliminated. It means that overall responsibility for and control

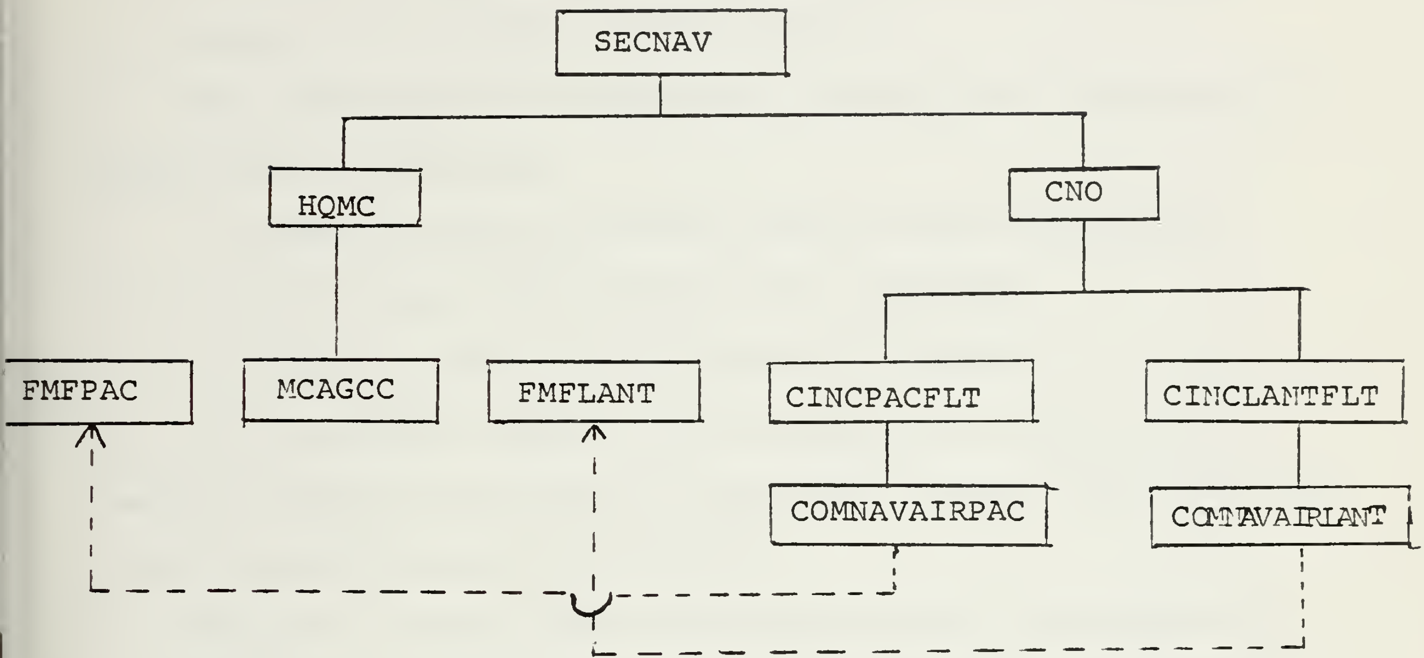


EXHIBIT 5-3. Proposed CAX Funding Flow.

of a program and its resources should be centralized within a command, rather than being shared by different commands. Since MCAGCC is best located to control CATP resources, it should be the command given overall responsibility.

Four advantages of centralizing control and budgeting with MCAGCC were identified.

1. Better control of excess supplies and ammunition.

2. More timely and accurate cost reporting.

3. Budgeting for the CATP would be simpler.

4. The Marine Corps, as an organization would benefit because Marine units would be receiving the same training, and would be doing so more efficiently.

Section C stated that centralized control and budgeting has been considered, but has not been adopted because Force commanders believe that such a system would remove their ability to influence the scope of CAX training, would violate long standing policy, and would have a deleterious effect on readiness. It was explained that these arguments lack merit because Force commanders would still play a major role in determining the scope of training, that long standing policy would be violated is an insignificant point in this particular case, and that readiness would not be affected by the type of budgeting system that is chosen.

In Section D, the flow of CATP funds under the present CATP budgeting system was compared to what the flow would be

under one that is centralized. The advantages of a centralized system were briefly reiterated.

VI. IDENTIFICATION OF COST COMPONENTS

A. ORGANIZATIONAL UNITS INVOLVED

Several different components of cost are associated with a CAX. However, each unit involved with the CAX may or may not incur a cost to each of these components. Before identifying the various costs that are incurred by each unit, the units involved in a CAX should be identified.

1. Ground Combat Element (GCE) - The GCE is the participating infantry battalion reinforced with combat support and combat service support units.

2. Air Combat Element (ACE) - The ACE is the air combat unit that provides close air support to the GCE. It also provides helicopter transport of equipment, supplies, and personnel. It consists of the aircraft, pilots, and necessary equipment and personnel to keep the aircraft operating. When a FMFPAC CAX is conducted, the entire ACE is provided by FMFPAC. However, FMFLANT, because of its geographical location, cannot furnish all aircraft support for FMFLANT CAXs. Therefore, FMFPAC also furnishes part of the ACE for FMFLANT CAXs. As a consequence, during a FMFPAC CAX, the cost of providing the ACE is borne totally by FMFPAC; but during a FMFLANT CAX, the cost of providing the ACE is shared by FMFLANT and FMFPAC.

3. Logistic Support Element (LSE) - The LSE provides combat service support to both ground and air elements during a CAX.

This includes maintenance of equipment, storage of supplies, etc. The LSE provides no support before or after the exercise. Maintenance provided does not include maintenance to aircraft or special aircraft related equipment. The ACE provides this maintenance.

4. Second Marine Aircraft Wing (2nd MAW) - Second Marine Aircraft Wing provides the personnel which make up the ACE for FMFLANT CAXs. For purposes of cost reporting, those expenses of the ACE which are paid for with O&M,MC funds, will be recorded as being incurred by 2nd MAW.

5. Third Marine Aircraft Wing (3rd MAW) - Third Marine Aircraft Wing provides the personnel which make up the ACE for FMFPAC CAXs. For purposes of cost reporting, those expenses for the ACE which are paid for with O&M,MC funds, will be recorded as being incurred by 3rd MAW.

6. Third Tank Battalion (3rd TK BN) - Third Tank Battalion, being a part of the CAC, is a tenant unit of MCAGCC. It furnishes the tanks and amphibious vehicles to be used by the GCE in each CAX.

7. First Battalion, Fourth Marines (1/4) - First Battalion, Fourth Marines is an infantry battalion assigned to the CAC and is tasked to provide aggressor forces when required.

8. Fourth Battalion, Eleventh Marines (4/11) - Fourth Battalion, Eleventh Marines is an artillery battalion assigned to the CAC to provide POST-CAX maintenance to the artillery pieces used in each CAX.

9. Communication Support Company (CSC) - The CSC is assigned to and is tasked to provide communication support for the CAC. It furnishes communication equipment to the TEECG and to the GCE when the demand exceeds the capacity of the EAP.

10. Equipment Allowance Pool (EAP) - The EAP is part of the MCAGCC and maintains a pool of equipment to be used only by units participating in a CAX and exists solely to support the CAX. The EAP maintains most of the non-combatant types of equipment that are needed to conduct a CAX.

11. Range Support Company (RSC) - Range Support Company is part of the MCAGCC. The CAX training area must be repaired/ restored after the conclusion of each CAX; the RSC fulfills this function.

12. Tactical Exercise Evaluation Control Group (TEECG) - The TEECG is also part of the MCAGCC and exists for the sole purpose of evaluation of the participating units of the CAXs.

B. COST COMPONENTS

Various cost components are incurred by each unit involved in a CAX. These costs are described below:

1. Temporary Additional Duty Pay (TAD) - Temporary Additional Duty Pay is the additional pay to personnel for being temporarily assigned from their parent base or station. Its purpose is to cover food and lodging expense during this time.

2. Transportation of People (TOP) - Transportation of People is the cost of transporting people to and from the Combat Center, regardless of the transportation mode.

3. Transportation of Things (TOT) - Transportation of Things is the cost of transporting equipment to and from the Combat Center, regardless of the transportation mode.

4. Maintenance of Equipment - This cost component includes maintenance of equipment both during and after a CAX. The maintenance performed after the CAX must include only the necessary maintenance resulting from the CAX.

5. Ammunition - This component includes all ammunition expended by the GCE and the ACE during a CAX. Additional firing of ammunition after the CAX should not be reported as a CAX cost.

6. Consumables - This is the cost of supply items that are consumed by the units participating in a CAX. Examples are fuel, radio, batteries, communications wire, etc.

7. Aircraft Fuel - This is the cost of the fuel that is used by the ACE in its role of air support to the GCE. Although this is a consumable type item, it must be identified separately from other consumables because it is furnished by the O&M, N appropriation. These O&M,MC funded items must be shown separately from O&M,MC funded items.

8. Replenishment and Replacement (Replen/Repl) - This is the cost of replacing lost or unserviceable individual equipment or unit organic equipment listed in the unit's Table of Equipment (T/E).

9. Operating Costs (Ops Cost) - Operating costs are the costs of the EAP and the TEECG to operate as functional units. Since these two units exist solely to support the CATP, these

costs must be included as CATP costs.

10. Range Repair - The RSC must repair the CAX training at the conclusion of each CAX.

C. CLASSIFICATION OF COST COMPONENTS

All CAX cost components identified earlier may be classified into one of the following categories:

1. PRE-CAX Costs - These costs include all costs directly related to a CAX which occur before the exercise commences.

2. DURING-CAX Costs - These costs include all costs incurred from CAX beginning to CAX termination as specified by the respective scheduled dates.

3. POST-CAX Costs - These costs include all maintenance costs within 30 days of the exercise conclusion, lost or unserviceable individual or unit organic equipment as a result of the CAX, and all returning TOT and TOP costs.

4. COMMON-CAX Costs -Common costs are those costs that must be attributed to the CATP, but cannot be attributed to a particular CAX. For example, the EAP uses consumable supplies and vehicles in support of its daily operations. The maintenance provided to these vehicles and the cost of these supplies are not directly related to any individual CAX.

Appendix A-1 shows a breakdown of cost components by unit into PRE-, DURING-, POST-, and COMMON-CAX cost classifications. All PRE-, DURING-, and POST-CAX costs are directly related to individual CAXs and are separated from the COMMON-CAX costs.

Total annual CATP cost can be expressed as shown below:

$$\text{Annual CATP Cost} = \text{PRE Cost} + \text{DURING Cost} + \text{POST Cost} + \text{COMMON Cost}$$

D. SUMMARY

This chapter has identified CAX cost components as incurred by participating units, and has classified them into PRE-, DURING-, POST-, and COMMON-CAX Cost classifications. These costs account for 100 percent of annual CATP costs. Later chapters will show the amount of these costs in previous CAXs, and will provide an estimate of these costs for a standard CAX that is developed.

VII. CRITIQUE OF CAX COST REPORTS

A. COST REPORT EVALUATION

A continuing problem has been the identification of costs that should be attributed to the CATP. The Fifth Annual CAX Planning Conference, held in May 1980, identified costs that should be considered as legitimate CAX costs. These costs are shown in EXHIBIT 7-1. A modified version of this report was proposed by the authors and presented as Appendix A-1.

Both formats separate the total CAX cost into PRE-, DURING-, and POST-CAX cost categories. In addition, the modified version includes a COMMON-CAX cost category, which includes certain costs that cannot be attributed to individual CAXs, but nonetheless must be considered as costs of the CATP. These are the day-to-day operating costs that are incurred by units existing solely to support the CATP. This category includes two units, the EAP and the TEECG.

Changes have been made to the "Unit" category. The Evaluated unit (BLT) has been changed to read GCE. The term "BLT" is an acronym for Battalion Landing Team, which in this case is synonomous with the authors' term Ground Combat Element (GCE). To say that the evaluated unit and the GCE are one and the same is incorrect. The evaluated unit in actuality contains more than the participating GCE. The GCE is combined with the ACE and the LSE to form an exercise force, in this case a Marine

UNIT	PRE	DURING	POST
Evaluated Unit (BLT)	TAD TOT/TOP	NONE	Replen/Repl Maint of Equip TOT/TOP
ACE	TAD TOT/TOP	NONE	TOT/TOP Replen/Repl
LSE	TAD TOT/TOP	Maint of Equip Consumables	TOT/TOP Replen/Repl TAD
MCAGCC FMF Units	NONE	NONE	Maint of Equip Replen/Repl
MCAGCC NON-FMF Units	Range Support EAP TAD TEECG	Fire fighers	Range Support Maint of Equip Replen/Repl
3rd MAW	TAD TOT/TOP	NONE	Maint of Equip Replen/Repl
Other (i.e. Radio BN, ANGLICO, Etc.)	TAD TOT/TOP	NONE	TAD TOT/TOP

EXHIBIT 7-1. Type of Cost By Period By Unit Identified In The Fifth Annual Planning Conference.

Amphibious Unit (MAU). The evaluation is not an independent evaluation of each of these units separately, but is one that determines how well the MAU has functioned as a combined arms force. The term "GCE" is a more accurate term since "Evaluated Unit," as used in the original format, is somewhat misleading because it identifies the GCE as a separate entity.

The modified version separates the ACE costs into those costs incurred by FMFLANT and FMFPAC. As explained in Chapter VI, during a FMFLANT CAX part of the ACE is provided by FMFPAC. Therefore, FMFPAC incurs ACE costs regardless of which FMF is conducting the exercise. This fact is not readily apparent under the original version of the cost report.

The original version specified that MCAGCC FMF units incur CAX cost. These are now subordinate units of the subsequently formed Combined Arms Command (CAC), and include First Battalion, Fourth Marines (1/4), Fourth Battalion, Eleventh Marines (4/11), Third Tank Battalion (3rd TK-BN), and Communications Support Company (CSC). The cost of these individual units cannot be determined from the original format because the costs are aggregated as one sum. Because the cost report should identify which units are incurring the most cost, the modified version reflects this fact.

Non-FMF units of MCAGCC, the EAP, TEECG, and the RSC, were listed as incurring CAX costs in the original version. Following similar logic, the cost to these units is reported separately in the modified version.

The original version shows an expense to "Other." This includes units which normally do not participate in a CAX, but do so only infrequently. Since the purpose of this thesis is to provide a means of estimating the normal cost of a CAX, an "Other" category does not appear in the modified version. It may be added to the cost report when necessary.

Changes that have been made to the PRE-CAX cost column are as follows:

1. The original version specifies that MCAGCC Non-FMF units incur PRE-CAX costs. This is true only for the TEECG who incurs TAD cost for Letter of Instruction (LOI) Conferences. The Officer in Charge of the RSC stated that he had to rebuild the CAX training area at the conclusion of each CAX, but that no PRE-CAX costs were incurred. The EAP also does not incur PRE-CAX costs. The EAP must provide maintenance to equipment after a CAX, but all other costs are COMMON-CAX costs that cannot be attributed to any one particular CAX. Therefore, the modified version specifies no PRE-CAX cost for the EAP or RSC, but does specify TAD as a PRE-CAX cost of the TEECG.

2. The original version specifies no DURING-CAX costs for the participating GCE. The GCE does technically incur a DURING-CAX cost in the form of ammunition. This ammunition expended by the GCE during a CAX is subtracted from their annual ammunition allotment. Headquarters, Marine Corps actually pays for this ammunition, which accounts for the fact it is not listed in

the original cost report. To state that ammunition is not a CAX cost is incorrect. For purposes of CAX cost reporting, the modified version shows ammunition as a cost to the unit that expends it.

3. The original version shows no DURING-CAX cost to the ACE. However, the ACE does incur cost of fuel and ammunition during a CAX. Ammunition is not shown for the same reasons as for the GCE. Fuel is a legitimate expense and should be attributed to the CAX as a DURING-CAX cost.

4. The original version specifies DURING-CAX cost to MCAGCC Non-FMF units for utilizing Firefighters to extinguish fires resulting from CAX operations. Firefighters are seldom required and the resulting cost is extremely small. Therefore, this cost has been eliminated from the modified cost report.

5. The original version specifies TAD as a POST-CAX cost to the LSE. THE FSSG states that the LSE incurs no TAD costs. Therefore, TAD is not included as a POST-CAX cost for the LSE in the modified version of the cost report. Originally, "Maintenance of Equipment" as a POST-CAX cost was not shown as a cost to the LSE. In theory, this should be true because the EAP is supposed to furnish all necessary non-combat CAX equipment. However, presently it does not have the equipment to do so and is usually augmented by the LSE. The LSE will continue to incur POST-CAX Maintenance of Equipment costs until the capabilities of the EAP are matched with the tempo of the CAXs.

Maintenance of Equipment is included as a POST-CAX cost to the LSE in the modified version.

Formalized CAX cost reporting began with CAX 4-80 in the format shown in EXHIBIT 7-2. It does not follow the format recommended by the Fifth Annual Planning Conference and is not recommended herein by the authors. Explanation of the various parts of the cost report along with the recommended changes are given below:

1. Units Involved

The units involved which incur CAX cost are shown across the top of the Matrix:

a. First Service Support Group (FSSG) - The FSSG is the parent command which furnishes the LSE for a CAX and is being used in the cost report rather than the LSE as shown in the modified version.

b. Third Marine Aircraft Wing (3rd MAW) - The 3rd MAW incurs a cost in every CAX and also appears in the modified version.

c. FMFLANT/FMFPAC - These units represent the cost (O&M,MC) of both the ACE and GCE of the respective FMF. The ACE and GCE are shown separately in the modified version as a cost report should identify which have incurred the most cost.

d. Combined Arms Command (CAC) - This unit represents the costs incurred by 4/11, 1/4, 3rd Tanks, and CSC. These units are also shown separately in the modified version.

	FSSG	3dMAW	FMFLANT/FMFPAC	CAC	MCAGCC
# per diem days					

PRE Costs	FSSG	3dMAW	FMFLANT/FMFPAC	CAC	MCAGCC
Ops/Admin					
Maintenance					
Training					
TAC AIR					
TOT/TOP					
Commercial Air					
Total					

DURING Costs

Maint of Equip
Ops/Admin*
Training
Med/Den
Other Log Supt
Maint of ASE
Total

* Ops/Admin and Maintenance combined

POST Costs

Replen/Repl
Training
Maint of Equip
TOT/TOP
TAC AIR
Commercial Air
Total

Total O&M,MC Cost = ________

O&M,N Costs:

OFC's	$Amount(FMFLANT)	$Amount(FMFPAC)
01		
50		
21		
23		
Total	________	________

Total Exercise Costs (O&M,MC + O&M,N) = ____________

EXHIBIT 7-2. Formal Cost Report Presently in Use.

e. Marine Corps Air Ground Combat Center (MCAGCC) - This unit represents the costs incurred by the EAP, TEECG, and the RSC. Similar logic separates these costs in the modified version.

2. Cost Components

The descriptions of the various cost components of the cost report presently being used have been modified. Maintenance of Equipment, TOP, TOT, and Replen/Repl have been retained, but the other cost components have been relabeled as follows:

a. Operations/Administration (OPS/ADMIN) - Operations/Administration appears in both the PRE-CAX and DURING-CAX categories. The Field Budget Guidance Manual defines Ops/Admin as follows:

> This unit includes all cost for administrative office supplies, magazines, newspapers, and periodicals; alterations to uniform clothing; and consumables and expendable supplies in support of operations and planning, POL, communications wire, and batteries. This unit includes TAD for inspections and the planning of training operations as well as costs for routing TAD. Also included is emergency leave travel for military personnel via MAC. If required, routine TAD and emergency may be shown as a separate local decision unit for local management purposes. Other Costs identified to this decision unit include printing and reproduction, welfare and recreation supplies, and Cognizance Symbol I Forms [16:6-9].

b. Training (Trng) - Training appears as a PRE-,DURING-, and POST-CAX cost and is defined below by the Field Budget Guidance Manual:

> This unit includes all costs which can be related to unit training and training operations (such as POL, TAD for training, communications wire, and batteries), replenishment of class IV training allowances expended in training, and

consumable and expendable supplies costs identified to this decision unit, including schools, training and the markmanship program [16:6-9].

c. Tactical Air (TAC AIR) - Tactical Air appears as a PRE-CAX and POST-CAX cost and is the cost of transporting personnel and their organic equipment to the Combat Center by military airlift. The two units involved in this category are the GCE and ACE (excluding flight crews) personnel from FMFLANT.

d. Commercial Air - Commercial Air appears as a PRE-CAX and POST-CAX cost and is the cost of transporting troops and their organic equipment by commercial air lines.

e. Other Logistic Support - Other Logistic Support appears as a DURING-CAX cost and is defined by the Field Budget Guidance Manual:

> This decision unit includes all costs incident to the hire and leasing of commercial vehicles in support of the operating forces, packaging, and preservation of material, offstation rental or real property utilities and services for exercises, contingencies and deployment, maintenance of real property and nonallowance list equipment at advanced bases, expeditionary minor new construction at advanced bases, and for all costs identified with civil disturbances [16:6-9].

In the present cost report the O&M,MC and O&M, N funds are separated with the O&M,N funds appearing at the bottom of the report under Operating Target Functional Categories (OFCs) as follows:

1. <u>OPTAR Functional Category (OFC-01)</u>

OFC-01 OPTARS are granted to FMF aviation unit commanders for the purpose of financing costs incident to the operation of aircraft. Primarily OFC-01 funds all petroleum

products (POL) consumed in flight operations and as one might expect, fuel accounts for the majority of O&M,N funds consumed by FMF Aviation units.

2. <u>OPTAR Functional Category (OFC-50)</u>

OFC-50 funds are provided to FMF aviation units to finance the maintenance of their aircraft. Examples of OFC-50 include aircraft spare parts, corrosion material, consumable handtools, and decals.

3. <u>OPTAR Functional Category (OFC-21 and 23)</u>

OFC-21 and 23 funds are for Temporary Additional Duty expenses of personnel attached to an aviation unit and includes authorized travel and per diem expenses.

All O&M,N costs are attributed to the ACE, and are shown as such in the modified version recommended by the authors. The OFC-01 category appears as a DURING-CAX cost to the ACE being relabeled as "Aircraft Fuel". The OFC-50 category appears as a POST-CAX cost being relabeled as "Maintenance of Equipment." Finally, OFC-21/23 categories appear as a PRE-CAX cost being relabeled as "TAD."

The presently-used cost report contains the following deficiencies:

1. <u>PRE-CAX Cost</u>

The only legitimate PRE-CAX cost that is incurred by any participating unit is TAD, TOT, and TOP. However, TAD is not listed and other components that should be excluded as a PRE-CAX cost are listed. These are Ops/Admin, Training, and

Maintenance. Recalling the definitions of OPS/Admin and Training one can see they are not specific cost components, but are both broad categories of costs covering a large variety of specific cost components. Therefore, listing them as cost components implies there are additional costs other than TAD, TOT, and TOP.

While Ops/Admin and Training do in fact include TAD/TOT/TOP, their use in the cost report makes the report difficult to interpret since they include by definition many other cost components. Using them also may create the possibility that inappropriate costs will be reported.

The report separates TOT/TOP from the TAC AIR and Commercial Air, and is somewhat confusing to the person attempting to interpret the report. Tactical Air is likely to be interpreted as Tactical Air maneuvers such as close air support of helicopter operations. Since, in this case, both Commercial Air and TAC AIR are used to mean the cost of airlifting personnel from the East Coast for CAX participation, TOT and TOP are better terms for this cost component. If an explanation of the mode of transportation is required it may be provided by footnote. Normally, the only personnel that will be airlifted are the GCE and ACE personnel from FMFLANT.

Maintenance is also shown as a possible PRE-CAX cost. This is an inappropriate cost because the unit is required to maintain their equipment regardless of whether or not they

participate in a CAX. Any maintenance performed prior to a CAX would in all likelihood, have been necessary anyway. Because of this it should not be attributed to the CAX. This is not to say special circumstances requiring legitimate PRE-CAX maintenance should be excluded. However, it is saying that maintenance should not appear in the cost report as a normal cost of the CAX.

The cost report will be more easily understood and less vulnerable to inaccuracies if the PRE-CAX cost components are limited to TAD, TOT, and TOP.

2. DURING-CAX Cost

Again the broad categories of Ops/Admin and Training are shown for DURING-CAX costs. They should be eliminated in the cost report for the above-mentioned reasons. "Other Logistic Support" is also listed as a possible DURING-CAX cost, which is improper. Recalling the definition of "Other Logistic Support" from the Field Budget Guidance Manual, one can determine that it also covers several different components of cost. However, none of them are incurred within the CATP and should be eliminated from the report. The only cost incurred during the CAX is the cost of consumable supplies to include POL, batteries, and communications wire; the cost of aircraft fuel and ammunition, the cost of ground ammunition, and the cost to maintenance of equipment during the CAX.

3. POST-CAX COST

The broad cost category of "Training" again appears as a possible POST-CAX cost and should be eliminated from the report as previously discussed. "TAC AIR" and "Commercial Air" again appear and should be classified as TOT/TOP for the reasons stated for PRE-CAX cost.

4. Other Deficiencies

The costs incurred by CAC and MCAGCC are aggregated and do not break the cost down by unit. If unit costs were shown, it could be determined which units were incurring the most cost and what those cost trends represent.

B. SUMMARY

The cost report presently utilized by MCAGCC separates PRE-, DURING-, and POST-CAX costs into broad cost categories. While this is the most convenient form for reporting purposes by MCAGCC, it is somewhat confusing as to what exactly should be included within each broad category by the participating units since no definitive agreement exists. If the cost information were gathered using the recommended format, it would be less confusing to the units submitting the cost report information and would present little difficulty for MCAGCC in the consolidation of these costs by decision unit for external reporting. Furthermore, the recommended format shows the cost to specific components so that those reading the report may see where the majority of CATP funds are being spent. This makes

the report more informative and facilitates planning of the CATP budget.

VIII. STANDARD CAX RESOURCES

A. APPROACH TO ESTABLISHING STANDARDS

1. Non-combat Equipment

Because of the wide variance in usage of numerous items presented in Appendix A-2, plus the fact that it shows only initial amounts requested which may have been subsequently modified; the standard package for non-combat equipment was established using expert opinion of the Installation and Logistics Directorate (I&L) based on their logistical experience in previous CAXs.

2. Ground Combat Equipment

Ground combat equipment is the sole category for which minimum levels have been established by MCAGCC Order 3500.11 for certain types of equipment [13:ENCL(2)P.1-2). For those type weapons not specified, T/Es were used because historical data concerning these weapons were not available.

3. Aircraft

The standard package for aircraft is based on historical data provided from the most recent CAXs and on expert opinions of commanding officers and operations officers of participating units. For CAX purposes, the desired mix specified in MCAGCC Order 3500.11 and shown in Appendix A-5 has been recommended by the participating units.

4. Ground Ammunition

Historical data was not used due to the extremely wide variance in usage per CAX. Marine Corps Order 8010.1C was utilized to determine the amounts of the various types of ammunition.

5. Air Ammunition

Those items which accounted for the majority of the ammunition cost were identified and the standard issue was created only from those items. Expert opinion was used to determine total numbers of the various types of ammunition that were identified. Totals assigned to each type ordnance, i.e., bombs (firebombs, HE, practice, etc.) and rockets (5", 2.75", practice, etc.) were allocated proportionally, based on historical data.

6. Consumables

As with air ammunition, those consumable items accounting for the majority of consumables cost were identified and the standard issue was created only for those items:

a. The Table of Authorized Material (TAM) and expert opinion were used to calculate fuel useage for vehicles.

b. The number of batteries were determined by use of T/Es to get the number of radios to be used and expert opinion from the CSC for battery life.

c. Communication wire usage is based exclusively on historical data. No expert opinion or published planning factors are available for determining the amount of wire that is required.

d. Lubrication oil usage is also based exclusively on historical data as no expert opinion or published usage rate exists.

B. STANDARD EQUIPMENT PACKAGE

As was explained in previous chapters, a standard equipment package is needed for the CATP to be conducted efficiently. To date, only minimum levels for certain types of combatant equipment have been established. Consequently, the types and amounts of some items of equipment used in past CAXs have varied significantly, as is shown in Appendix A-2. This is especially true for noncombatant equipment such as trucks.

The types and amounts of ground combatant equipment used in past CAXs have not varied significantly in most cases. However, data pertaining to the number of various types of aircraft used in previous CAXs were obtained for CAX4-80 and 5-80 only. These were both FMFPAC CAXs, and both used more aircraft than is specified as the desired amount in MCAGCC Order 3500.11. To accurately plan the CATP budget a standard package for noncombatant equipment, ground combat equipment, and aircraft must be developed.

Creating a standard equipment package is a difficult task. Since deciding the proper types and amounts of equipment to be used in a CAX is a subjective matter, there is disagreement as to what a standard equipment package should contain. The standard package for noncombatant equipment that is recommended

by the authors was created by MCAGCC's Installations and Logistics Unit (I&L), and is shown in Appendix A-3. I&L maintains the EAP and helps to coordinate and arrange for equipment that cannot be furnished by the EAP or units of the CAC. Therefore, I&L is logistically involved in every CAX. Because of this, the package they have developed is considered, by the authors, to be as realistic as any package that could have been developed independently. To the knowledge of the authors no other recommended package has been developed. The fact that one has been developed by I&L is a positive step in the direction of obtaining CATP efficiency.

The standard package for ground combatant equipment is shown in Appendix A-14. This package includes battery powered radios, tanks, amphibious vehicles, artillery pieces, and organic infantry weapons to be used by the units of the GCE.

The standard number of radios (items A0320 through A2050) was obtained by assigning to each of the units the number shown on their respective Tables of Equipment (T/E). The number of artillery pieces (items E0640 and E0663) was obtained from MCAGCC Order 3500.11 which specifies a minimum level of four tubes in direct support, two tubes in general support, and two tubes simulating Naval gunfire [13:ENCL(2)P.1]. The four tubes in direct support and the two tubes in general support can be provided by the EAP since they have six 105MM howitzers on their T/E. Fourth Battalion, Eleventh Marines can furnish the

two 155MM howitzers to simulate naval gunfire. The number of amphibious vehicles and tanks (items E0663 through E0855, and E1875) was also obtained from MCAGCC Order 3500.11 which specifies the amounts shown as the minimum number to be used and also because these are the amounts most often requested by the participating units as shown in Appendix A-2. The number of M203 grenade launchers shown is the number that would be carried by the infantry battalion's three rifle companies calculated on the basis of 9 platoons each carrying 9 grenade launchers. This is equivalent to one grenade launcher for each fire team in the platoons. The number of 66MM rocket launchers, 60MM mortars, M16A1 rifles, and Dragons was obtained by assigning to the infantry battalion the number specified in the T/E for an infantry battalion. The number of machine guns assigned to the infantry battalion and tank company was obtained in the same manner. The number of machine guns assigned to the amphibious assault platoon was taken from Fleet Marine Force Manual 9-2 which specifies that amphibious vehicles, LVTPS, are armed with a .50 caliber machine gun, and that amphibious vehicles, LVTRs and LVTCs, are armed with a 7.62MM machine gun [14:89,93,95].

MCAGCC Order 3500.11 specifies a desired mix of aircraft to support a CAX [13:ENCL(3) P.3]. This mix is recommended as the standard aircraft package to be used in a CAX, and is shown in Appendix A-5. Aircraft availability has already been provided for in the numbers shown.

One may question the appropriateness of the minimum levels of combatant equipment specified in MCAGCC Order 3500.11 as the standard amounts to be used in a CAX. The logic behind this is that if these amounts are what is needed to accomplish the objectives of the CATP, to use more would increase the cost of the program unnecessarily. As was previously stated, one should question whether or not additional equipment is needed to accomplish the CATP's primary objectives as specified in MCAGCC Order 3500.11. If it is not, then it should not be used because doing so is probably not worth the additional cost.

C. STANDARD SUPPLY ISSUE

Chapter III explained that more than 147 different consumable supply items have been used in past CAXs. To develop a standard amount for each of these items is both unrealistic and unnecessary. As can be seen from Appendix A-8 four types of these supplies have accounted for an average of 78 percent of total supply cost. They are fuel, radio batteries, wire,and lube oil. These are the only supplies for which a standard package is necessary. For budgeting purposes, once the cost of these supplies have been estimated, one should remember that it represents approximately 78 percent of total supply cost. Total estimated supply cost may then be proportionally calculated.

Appendix A-9 shows the estimated amount of fuel to be used by noncombatant and combatant type equipment during a CAX. The equipment shown is the fuel consuming equipment that is listed in Appendix A-3 and Appendix A-4, which present the standard package of combatant and noncombatant equipment in this thesis. Appendix A-9 is explained as follows:

1. Column One - The first column specifies the Table of Authorized Material number (TAM #) for each item.

2. Column Two - The second column gives the nomenclature for this item of equipment.

3. Column Three - The third column specifies the type of fuel used by each item of equipment. Gasoline and diesel fuel are designated by "G" and "D", respectively.

4. Column Four - The fourth column gives the gallons of fuel used per day by each item of equipment. This number was taken from the United States Marine Corps Table of Authorized Material which specifies fuel consumption rates for Marine Corps equipment [18:23-1 to 23-8]. Actual fuel consumption for past CAXs has not been recorded.

5. Column Five - The fifth column specifies the number of days that each item of equipment is estimated to be used in a CAX. These figures were obtained from MCAGCC's Installation and Logistics Unit. Notice that the figures are different for differing types of equipment. Fifteen days is the approximate duration of a CAX. Some items of equipment are used for the

entire duration while others are not. I&L did not use any quantifiable method of analysis to derive the figures in this column. The actual number of days these items of equipment were used in past CAXs has not been recorded. Therefore, these figures are probably not as accurate as is desired but are the best ones available at this time.

6. Column Six - The sixth column specifies the estimated number of gallons of fuel to be used per CAX by each item of equipment. This figure is obtained by multiplying column four (gal/day) by column five (# days).

7. Column Seven - The seventh column specifies the number of each type of equipment to be used in CAX. These numbers were taken from Appendix A-3 and Appendix A-4, which respectively are the standard packages of noncombatant and combatant equipment that is recommended in this thesis.

8. Column Eight - The eighth column specifies the estimated gallons of fuel to be used by each item of equipment per CAX. This figure was derived by multiplying column six (Gal/Mach/CAX) by column seven (#Mach).

The last page of Appendix A-9 specifies the total number of gallons of fuel that is estimated to be used by the non-combatant and combatant equipment in a CAX. This sums to 12,784 gallons of gasoline and 38,168 gallons of diesel fuel. These amounts are recommended as the standard amount of fuel for a CAX.

Appendix A-10 shows the estimated number of radio batteries to be used during a CAX. The types and number of radios shown are the types and number being recommended as standard for a CAX. Column four specifies the type of battery used by each type of radio and column five specifies that each type of radio holds only one battery. Column six specifies a usage factor that is common to each battery type. This factor was obtained by dividing the number of hours the tactical exercise is estimated to last by the estimated life of a radio battery. The exercise is estimated to last 96 hours (four days) and the life of the radio batteries is estimated to be 20 hours. Under normal use a radio battery will usually last approximately 24 hours. However, due to the heat at Twentynine Palms they probably last somewhat less than this. Therefore 20 hours is thought to be a more accurate estimation. The last column specifies the estimated number of each type of battery that is needed for a CAX. This number is calculated by multiplying column three (# Radios used) by column six (usage factor). These amounts are recommended as the standard number of batteries for a CAX.

Appendix A-11 shows the number of rolls of telephone communication wire that was purchased for previous CAXs, and also shows an average number per CAX. The amount actually used is unknown as actual usage records have not been kept, and no manual showing usage rates for communication wire exists.

Because of this creating a standard amount of communication wire for a CAX is difficult. From Appendix A-11 one can see that beginning with CAX 3-79 cable w-o/outer case ranges from 29 rolls to 70 rolls. An average of these numbers is the best estimate that can be made based on such limited information. Therefore, 44 rolls of phone cable w-o/outer case and 45 rolls w/outer case is recommended as the standard amount for a CAX.

Appendix A-12 shows the number of drums of lube oil purchased for previous CAXs, and also an average number per CAX. Again, the actual amount used is unknown because actual usage data was not recorded. So the same difficulty is encountered in creating a standard amount of lube oil as was encountered in creating one for communication wire. As can be seen from the appendix the amount purchased has varied significantly. The reason for these wide variations are unknown. Because of this the average figures shown are questionable; however, they are the best estimates the authors could make because no other information is available. Therefore, the average figures shown in the appendix are recommended as the standard amount until better information becomes available.

D. STANDARD GROUND AMMUNITION PACKAGE

Appendix A-16 shows the standard ground ammunition package that is recommended. Column one gives the type of weapon and column two gives the Department of Defense Identification Code (DODIC) for the different types of ammunition fired by

each type of weapon. Column three gives an average number of rounds fired per day for each type of round. These numbers were obtained from Marine Corps Order (MCO) 8010.1C which is used for initial planning of combat operations [15:1]. Column five gives the number of weapons that will fire each type of round shown. These are the same numbers that are shown in Appendix A-4, the standard package for combatant type equipment. Column six then gives the standard issue that is recommended for each type of round. This figure is obtained by multiplying column three (Qty/Day) by column four (#Days) by column five (#Wpns).

When referring to MCO 8010.1C one will see that the types of rounds there listed do not in every case match the types of rounds listed in Appendix A-16. The reason is that MCO 8010.1C only lists required types of ammunition. Also, it is dated 2 January 1979. Since that time rounds may have been modified, and therefore use a different DODIC. For example, there are three different types of High Explosive (HE) rounds for a 105mm howitzer. They are C443, C444, and C445. All three are modifications of the same round. Therefore, the quantity of rounds used per day for planning purposes is assumed to be the same for all three rounds, even though MCO 8010.1C lists the usage factor for C445 only. For CAX planning purposes the important thing is to plan for the correct number of HE rounds, not which type of HE round is used. So one should not conclude that just because a type of round listed in

MCO 8010.1C is not listed in Appendix A-16 as part of the standard ground ammunition package, that no ammunition of that category has been planned without first checking Appendix A-17 which lists the DODIC for rounds that are substituable for CAX purposes. Appendix A-13 and A-14 show the quantity and cost of ground ammunition in previous CAXs.

These are not the only types of ammunition that were used in previous CAXs, nor are they the only ones that will be used. However, as can be seen from Appendix A-15, they have accounted for an average of 90 percent of total ground ammunition cost. Therefore, when the cost of this standard ammunition package is calculated, one should remember that it represents approximately 90 percent of the total amount of funds needed for ground ammunition for a CAX. Total estimated ground ammunition cost may then be calculated proportionally.

E. STANDARD AIR AMMUNITION PACKAGE

Appendix A-18 shows the types and quantities of air ammunition that were expended in previous CAXs. Creating a standard issue for each type of ammunition shown would be impractical. Appendix A-19 shows the total dollar amount for air ammunition expended in previous CAXs. A standard ammunition package is created only for those types of ammunition accounting for the majority of total air ammunition cost. As can be seen from Appendix A-20 those items are bombs (real and practice), 2.75-inch rockets (real and practice), 5-inch

rocket motors, rocket launchers, and firebomb initiators. These items have accounted for an average of 84 percent of total air ammunition costs in previous CAXs. Therefore, they are the types of air ammunition for which a standard should be developed.

No manual is available from which usage factors may be drawn to estimate needed amounts of air ammunition as was the case for ground ammunition. Therefore, a method of estimating the amount had to be developed. The method that was developed is based in the average number of sorties flown per day for each type of aircraft using the ammunition shown in Appendix A-20. This standard package should not change if the number of aircraft used is varied because the number of sorties depends on the number of air-strikes called for by the ground commanders, not the number of aircraft used. Bombs are dropped by the A-6s, A-4s, F-4s and the AV-8s. Rockets are fired by the OV-10s and the AH-1s. Although the A-4s, A-6s, F-4s, and AV-8s also have the capability to fire rockets and have fired rockets during most CAXs, they primarily carry bombs. For purposes of creating a standard air ammunition package, rockets are assumed to be fired only by OV-10s and AH-1s.

Appendix A-24 shows aircraft statistics for CAX operations that were obtained via telephone from the commanding officers and/or operations of the squadrons shown. They were asked for their best estimate of the number of sorties flown per day and the duration of each sortie. The average number of

sorties per day is multiplied by the ammunition load for each type of aircraft in order to estimate the quantity of each type of ammunition needed per day. The authors assume that the entire load of ammunition is expended during the sortie. The operations officers of the various squadrons indicate that this is usually the case. The CAX ammunition loads for the aircraft are shown below.

TYPE AIRCRAFT	LOAD
A-4	6 bombs
A-6	15 bombs
AV-8	4 bombs
F-4	10 bombs
OV-10	8 5" rockets or 14 2.75" rockets
AH-1	14 2.75" rockets

Appendix A-22 shows the estimated number of bombs and rockets to be expended per CAX. This number is calculated by multiplying average sorties per day by the number of days air support is used during the CAX, and then multiplying this product by the ammunition load for each type of aircraft. Since the desired mix of fixed wing aircraft calls for using A-4s and A-6s, AV-8s and A-6s, or F-4s and A-6s, the standard number of bombs will vary depending on which combination is used. The standard number for the three possible combinations is shown below:

A-4s and A-6s = 783

AV-8s and A-6s = 915

F-4s and A-6s = 1011

The total number of rockets remain the same in all cases, 638 2.75-inch rockets and 48 5-inch rockets. The total number of bombs and rockets must now be broken down into the specific types of bombs and rockets to be used.

From Appendix A-21 one can see that five different types of real bombs and two types of practice bombs have been used in previous CAXs in various quantities. No desired mix of bombs has been specified and no pattern has been shown from past data except that bomb E807 is used in the smallest quantities in most cases. Bomb E807 is a very expensive bomb, which explains why it has been used in such small quantities. No strong opinion was found to exist as to the number of bombs of this type that should be used in a CAX. Because of this, the minimum number that has been used in the past is also recommended for the future so that cost may be minimized. From Appendix A-21 that number is shown to be six.

Bombs E481 and E482 are both 500 lb., high explosive bombs. These bombs were used in five out of the six CAXs shown in Appendix A-21, and accounted for the largest percentage of the real bombs expended in each case. Squadron operations officers indicate that this is the bomb that will be carried in most cases when real bombs are dropped, but that an uncertain amount

of 250 lb. high explosive bombs (E465) and firebombs (E134) also are normally expended in a CAX. Since no specific mix was found to be preferred, the authors have assigned weights of 50 percent to 500 lb. HE bombs and 25 percent to both the 250 lb. HE bomb and the firebomb to be applied to the number of bombs remaining after the six E807 bombs and the practice bombs have been deducted. Practice bombs averaged 49 percent of total bombs dropped in previous CAXs, and this proportion has been used in estimating the number of practice bombs for a CAX. The estimated number of practice bombs is allocated equally to the two types shown in Appendix A-21. Because bomb E481 was used in only one of the six CAXs shown, bomb E482 is assumed to be the type of HE 500 lb. bomb that will be used. Based on these assumptions the standard number of bombs is shown in Appendix A-22.

An OV-10 can carry 14 2.75-inch rockets or eight 5-inch rockets. An AH-1 can carry 14 2.75-inch rockets. Squadron operations officers indicate that the OV-10s carry 5-inch rockets only about 20 percent to 25 percent of the time and that 2.75-inch rockets are carried for all other sorties. Since the average number of sorties per day for OV-10s is four, the authors have assumed that in one out of every four OV-10s sorties, 5-inch rockets are used. They also specified that all rounds are normally expended during each sortie that is flown. The AH-1s fly attack missions in about 50 percent of their sorties,

but that all 14 rockets are normally expended when an attack mission is flown. That is why in Appendix A-22 the average number of sorties per four is AH-1s is divided by two in calculating the ammunition needed per CAX for that aircraft.

Two types of real rockets used are smoke and high explosive. The general attitude expressed by squadron officers is that both should be supplied in sufficient quantities; but as was the case with bombs, no preferred mix has been specified. Appendix A-21 shows that in some CAXs more smoke rockets were expended, and in some CAXs more HE rockets were expended. For purposes of creating a standard air ammunition package, the assumption is that the estimated total number of rockets to be expended is divided equally between smoke and HE, after the practice rockets have been deducted. Rockets H842 and H855 are assumed to be the types that will be used since they were both used in five of the six CAXs shown in Appendix A-21. Practice rockets accounted for an average of 43 percent of the total number of 2.75-inch rockets fired for the four CAXs in which they were used, and this proportion has been used in estimating the number of 2.75-inch practice rockets for a CAX. The resulting number is allocated equally to the two types of practice rockets shown in Appendix A-21. Based on these assumptions the standard number of 5-inch and 2.75-inch rockets is shown in Appendix A-22.

The cost of four accessory items must be estimated when firebombs and rockets are expended. These four items are shown below:

TAM #	Nonmenclature	Usage Rate
E134	Firebomb Initiator	2 per Firebomb
J102/106	2.75" Rocket Motor	1 per Rocket
J270/271	5" Rocket Motor	1 per Rocket
H138/141/142	Rocket Launcher	N/A

The rocket launchers are reusable and return with the aircraft when a sortie is completed. They do become unserviceable after being used for several firings. From Appendix A-18, one can see that rocket launcher H138 usage ranged from 12 to 22 for past CAXs, with the average number being 18. It was used in three of the six CAXs shown. Rocket launcher H142 was used in four of the six CAXs listed, and ranged from eight to 28 in the number expended with the average being 16. These averages are the recommended number of launchers as standard for a CAX, and are shown as such in Appendix A-23. Rocket launcher H141 was used in only one of the six CAXs listed in Appendix A-18, and is not included as part of the recommended standard air ammunition package. Two types of 5-inch rocket motors are shown in Appendix A-18 either of which may be used for CAX purposes. The total number is alloted equally between the two. Appendix A-23 shows the standard number for these accessory items.

F. NUMBER OF PERSONNEL INVOLVED IN A CAX

The number of personnel involved in a CAX varies from one exercise to another, as participating units differ in their personnel strengths. Calculating the number of people for the GCE is easy enough if Table of Organization (T/O) strengths are used for each unit making up the GCE. However, units are seldom at T/O strength, and they normally leave skeleton crews behind when departing to participate in a CAX. Therefore, T/O strengths minus 25 percent is the estimated number of personnel for the GCE in this study. This may be realistic for some CAXs but less realistic for others. Appendix A-26 shows the estimated number of personnel for a CAX.

The number of personnel shown for the LSE in Appendix A-26 was obtained from Detachment "A", First Force Service Group, FMFPAC located at the Combat Center. Twelve officers and 230 enlisted men was specified as the normal size of the LSE for a CAX.

The number of personnel shown for the ACE is based on the desired aircraft mix specified in MCAGCC Order 3500.11 and shown in Appendix A-5. The number of officers shown for the fixed wing and helicopter support elements are the number of pilots necessary to fly this desired mix of aircraft, plus one extra crew for each type of aircraft. The number of enlisted men shown for the fixed wing and helicopter units

were obtained from the respective parent aircraft group and squadron operations officers. Of course these numbers will vary from one CAX to the next, but if the desired mix of aircraft specified by MCAGCC Order 3500.11 is followed, they should not vary significantly.

For planning purposes, the number of personnel shown in Appendix A-26 is recommended as standard.

G. SUMMARY

This chapter has shown the recommended standard packages for equipment, supplies, ammunition, and personnel. Chapter IX presents a cost analysis of previous CAXs and Chapter X presents the estimated cost of a standard CAX based on the standard resource packages presented in this chapter.

IX. COST ANALYSIS OF PREVIOUS CAXS

The following paragraphs contrast the costs reported for CAXs 4-80 through 7-80 with the costs the authors estimate should have been reported. EXHIBITS 9-2A, 9-5A, 9-6A, and 9-8A present the formal cost reports that were submitted for CAXs 4-80 through 7-80, respectively. EXHIBITS 9-2B, 9-5B, 9-6B, and 9-8B present the authors' adjusted cost reports for these same CAXs. One should note that some costs appearing as Ops/Admin or Training costs in the formal cost reports have been relabeled or simply not reported in the adjusted cost reports. The adjusted cost reports include only those cost components identified as legitimate CAX costs in Chapter VI. Reference to Chapter VI might be necessary when reading this chapter.

A. LSE COST DIFFERENCES

One can see from the formal cost reports that FSSG reported PRE-CAX costs of Maintenance, Training, and Ops/Admin in previous CAXs. Any maintenance performed prior to the CAX is not legitimate CAX cost, and Training and Ops/Admin are such broad cost categories that confusion exists as to what should be reported in these cost components. By definition they include several things besides TOT and TOP which are the only legitimate PRE-CAX costs of the LSE. No TOT or TOP costs were reported by the LSE in CAXs 4-80 through 7-80.

CAXs 4-80 and 5-80 were back-to-back. The LSE remained at the Combat Center for the duration of these two CAXs. Therefore, the LSE incurred PRE-CAX TOT and TOP for CAX 4-80, and POST-CAX TOT and TOP for CAX 5-80. The same situation existed for CAXs 6-80 and 7-80. The adjusted cost reports show these costs in the amount of $2,000. This figure is based upon the cost for TOT/TOP that FSSG submitted to MCAGCC as being incurred by the LSE in CAX 2-80, prior to the beginning of the formal cost reporting system that now exists. The accuracy of this figure is unknown, but it is probably more accurate than the amounts reported as Training or Ops/Admin in the formal cost reports. The costs of TOT/TOP might be included in these broad categories, but there is no way of knowing.

The LSE incurs DURING-CAX costs of Med/Den, Maintenance of Equipment, and Consumables. The reported costs for Med/Den are legitimate and are reflected in the same amounts in the adjusted cost reports. However, the cost of Consumables and Maintenance are not readily apparent from the formal cost reports.

The broad cost categories of OPS/Admin and Training again appear as DURING-CAX cost components in the formal cost reports. These categories account for most of the costs reported by FSSG in CAXs 4-80 through 7-80. DURING-CAX Maintenance of Equipment costs were reported for CAXs 6-80 and

7-80, but not for CAXs 4-80 and 5-80. Maintenance of Equipment cost is included in the cost reported for OPS/Admin for CAXs 4-80 and 5-80 (see note at bottom of DURING-CAX costs).

The cost of consumables can be verified from Appendix A-8, which shows the cost of consumables for previous CAXs. As can be seen, the consumables for CAXs 4-80 and 5-80 were combined. Therefore, the actual consumables cost for each CAX is unknown. This total amount is allocated equally to these two CAXs in the adjusted cost report. The consumables cost shown in Appendix A-8 for CAXs 6-80 and 7-80 are reflected in the adjusted cost report.

The DURING-CAX Maintenance costs reported by the LSE for CAXs 6-80 and 7-80 are also reflected in the adjusted cost report. However, maintenance costs for CAXs 4-80 and 5-80 had to be estimated. With a total consumables cost of $192,400 for CAXs 4-80 and 5-80, total maintenance costs for these CAXs cannot be more than $21,361, the total reported cost for OPS/Admin and Training minus total consumables cost ($213,761-$192,400). Most of this $21,361, if not all of it, can probably be attributed to maintenance, as maintenance provided during the CAX is the most expensive maintenance cost because maintenance is provided to all ground equipment for approximately 15 days. Based on this premise the authors have allocated the entire amount equally to each CAX in the adjusted cost reports.

The formal cost reports shows that FSSG reported POST-CAX costs of Training and Maintenance of Equipment. All reported maintenance costs are also reported in the adjusted cost reports. Since the only legitimate POST-CAX costs of the LSE are Maintenance of Equipment, Replen/Repl, TOT, and TOP, the costs reported as Training are not shown in the adjusted cost reports.

B. GCE COST DIFFERENCES

The GCE may legitimately incur both PRE-CAX and POST-CAX TOT and TOP costs. In CAX 4-80, PRE-CAX TOT/TOP costs and POST-CAX TOT/TOP costs were reported in the amounts of $3,973 and $1,986, respectively; while in CAX 5-80, only POST-CAX TOT/TOP cost was reported in the amount of $5,678. Commanding General, First Marine Division (CG, 1st MAR DIV) Message R 130037Z August 1980 specifies that the entire TOT/TOP costs reported for CAX 4-80 was for TOP and that no TOT costs were incurred [4:1]. CG, 1st MAR DIV Message R 130038Z August 1980 specifies that PRE-CAX TOP cost for CAX 5-80 was $1,986 and POST-CAX TOP cost was $3,692, and that no TOT cost was incurred [5:1]. Therefore, the PRE-CAX and POST-CAX costs for CAX 5-80 were mistakenly added together and reported in total as POST-CAX TOT/TOP cost. The TOT and TOP costs for CAXs 4-80 and 5-80 are shown correctly in the adjusted cost reports.

In CAXs 6-80 and 7-80 FMFLANT reported PRE-CAX and POST-CAX costs for TAC AIR. This is the cost of transporting East Coast non-pilot personnel of the ACE and GCE to and from the Combat Center by military airlift. The total number of personnel transported is unknown so the amount that should be attributed to the GCE and to 2nd MAW is unknown. Therefore, the entire amounts for both CAXs are reported as TOP costs of the GCE.

TAD is not listed as a cost in the formal cost report; however, one knows that it is included in the Ops/Admin or Training categories because the formal cost report does show the number of per diem days incurred by participating units. No per diem days were reported for the GCE in CAXs 4-80, 5-80, and 7-80. In CAX 6-80 FMFLANT reported 167 per diem days. According to the Controller, FMFLANT, the $3,550 reported as Ops/Admin was the total expense for these per diem days, which equals $21.25 for each per diem day. He further stated that five of these per diem days were incurred by the GCE. Therefore, the CAX 6-80 adjusted cost report reflects a TAD cost of $106 attributed to the GCE. However, the GCE will normally not incur TAD expense because its personnel are normally on field duty during the CAX.

The formal cost reports do not show the cost of ammunition that was expended during the CAXs. The adjusted cost reports do reflect ammunition cost for these CAXs as calculated in Appendix A-14.

The GCE may legitimately incur costs for maintenance of equipment; although, normally it will not do so. The reason is because the LSE normally makes up for EAP equipment deficiencies. No Maintenance of Equipment costs were reported in the formal cost reports,and none are shown in the adjusted cost reports.

The GCE may legitimately incur costs for replen/repl. CAXs 4-80 and 5-80 were both FMFPAC CAXs in which the GCE reported Replen-Repl costs of $4,830 and $4,165 respectively. The adjusted cost report for CAX 5-80 reflects this same cost. However, CG, 1st MAR DIV Message R 130037Z August 1980, shows that Replen/Repl cost for CAX 4-80 was $4,803 vice $4,830 [4:1]. The correct figure is shown in the CAX 4-80 adjusted cost report.

FMFLANT reported total Replen/Repl costs in CAXs 6-80 and 7-80. Therefore, the amounts that should be attributed to the GCE and 2nd MAW are unknown. Because of this the entire Replen/Repl costs reported by FMFLANT for these CAXs is attributed to the GCE is the adjusted cost reports.

C. ACE COST DIFFERENCES

ACE cost as listed in the adjusted cost report includes only O&M,N monies, with TAD of air crew personnel being the only valid PRE-CAX cost. The formal cost report lists this cost as O&M,N OFCs 21 and 23.

DURING-CAX cost of the ACE is limited to the cost of aircraft fuel consumed during the CAX. The adjusted cost report lists this cost as ACE O&M,N for Aircraft Fuel, while the formal report lists it as O&M,N OFC-01 cost. Although aircraft maintenance occurs during the CAX, these costs have been consolidated as a POST-CAX cost.

POST-CAX cost includes only maintenance of equipment (aircraft and aircraft related equipment). Both reports consolidate these costs as total cost and do not distinguish between DURING-CAX and POST-CAX cost. This is done to simplify the accounting for DURING-CAX maintenance cost when repair components are issued at a location other than the Combat Center. The formal cost report lists these Maintenance costs as O&M,N OFC-50, while the adjusted cost report lists them as ACE O&M,N Maintenance of Equipment costs.

The amounts of ACE costs reflected in the adjusted cost report is the same as reported in the formal cost reports.

D. 2ND MAW COST DIFFERENCES

2nd MAW may legitimately incur both PRE-CAX and POST-CAX TOT and TOP costs. TOT costs for 2nd MAW are normally not incurred because the cost of transporting equipment from the East Coast is very expensive. No TOT costs were incurred by 2nd MAW in CAXs 6-80 or 7-80. As was explained in Section "B", 2nd MAW did incur TOP costs for transporting non-pilot personnel to and from the Combat Center by military airlift. However,

the entire amount is attributed to the GCE for reasons explained in that section.

FMFLANT reported 167 per diem days and 157 per diem days for CAXs 6-80 and 7-80, respectively. The PRE-CAX cost reported as Ops/Admin for these two CAXs included only TAD expense. As explained in Section "B" only 162 of the per diem days for CAX 4-80 were incurred by 2nd MAW at an estimated per diem rate of $21.25. Therefore, the adjusted cost report shows 2nd MAW incurring TAD cost of $3,444. The Controller, 2nd MAW, stated that the 157 per diem days for CAX 7-80 were incurred in total by 2nd MAW. Therefore, the PRE-CAX cost for Ops/Admin in this CAX is also reflected in the adjusted cost report.

The formal cost reports show no cost for air ammunition expended in CAXs 6-80 and 7-80. The adjusted cost reports do reflect air ammunition costs as calculated in Appendix A-19.

2nd MAW may legitimately incur replen/repl costs, and most likely did incur these costs in CAXs 6-80 and 7-80. However, the entire amount reported by FMFLANT for these CAXs was attributed to the GCE for reasons explained in Section "B".

A problem is created when FMFLANT reports total costs for the GCE and 2nd MAW. One cannot tell from the cost report the amount that was incurred by each of these units. Therefore, when these costs increase or decrease significantly, one

cannot tell from the cost report which unit is responsible. The cost report should reflect which units account for the majority of the cost.

E. 3RD MAW COST DIFFERENCES

3rd MAW may legitimately incur both PRE-CAX and POST-CAX TOT and TOP costs. 3rd MAW reported PRE-CAX TOT/TOP cost for CAXs 4-80 and 5-80 in the amount of $1,750. Commanding General, Third Marine Aircraft Wing (CG,3rd MAW) Message R 082212Z August 1980 specifies that $1,250 of this amount was for TOP and $500 for TOT [7:2]. This is reflected in the adjusted cost reports. Also, it is shown as a POST-CAX cost for CAX 5-80 rather than a PRE-CAX cost. Because CAXs 4-80 and 5-80 were back-to-back CAXs, 3rd MAW units remained at the Combat Center after CAX 4-80, thereby incurring no PRE-CAX TOT or TOP costs for CAX 5-80.

3rd MAW reported $750 as TOT/TOP cost for CAXs 6-80 and 7-80. CG, 3rd MAW Message R 022114Z September 1980 specifies that TOT costs were incurred by 3rd MAW in the summed total amount of $1,500 for the two CAXs [8:1]. No TOP costs were incurred because the number of personnel supplied was minimal, and were transported to the Combat Center aboard the helicopters 3rd MAW provided for the CAX. For cost reporting purposes the $1,500 was allocated equally to each CAX. The adjusted cost reports reflect this cost as TOT.

No TAD cost component is reflected on the formal cost reports, although it does report that 3rd MAW incurred 25 per diem days in CAXs 4-80 and 5-80, and 102 per diem days in CAXs 6-80 and 7-80. The per diem days for CAXs 4-80 and 5-80 were incurred by the ACE staff which attended LOI conferences at Camp Pendleton. The Controller, MCAGCC, stated that the per diem rate to attend these conferences was $50 for each per diem day. Therefore, the adjusted cost reports reflect $1,250 of TAD cost to 3rd MAW for CAXs 4-80 and 5-80.

The Ops/Admin cost of $2,250 in both CAX 6-80 and 7-80 is the TAD expense for the 102 per diem days incurred by 3rd MAW in these CAXs. CG, 3rd MAW Message R 022114Z September 1980 specifies that in CAXs 6-80 and 7-80 officers incurred 14 per diem days and enlisted men incurred 190 [8:1]. For cost reporting purposes they were allocated equally between the two CAXs. Therefore, of the 102 per diem days reported for these CAXs, seven were incurred by officers and 95 by enlisted men. Multiplying the number of per diem days for officers and enlisted men by their respective per diem rates will not give the $2,250 shown as Ops/Admin cost for the formal cost reports. The reason is that military quarters were not available for all of 3rd MAW personnel. Consequently, some of them had to stay in motels which increases their per diem rate to $50 for each per diem day. The adjusted cost reports reflect this same amount as TAD costs to 3rd MAW.

One may question why 3rd MAW incurs more per diem days for a FMFLANT CAX in which it furnishes only a small portion of the ACE than for a FMFPAC CAX when it furnishes the entire ACE. When the ACE is furnished entirely by 3rd MAW the ACE personnel are sent to the Combat Center by "group orders" and the only per diem days incurred are those for the ACE Staff to attend LOI conferences at Camp Pendleton. However, during FMFLANT CAXs 3rd MAW sends personnel to augment the Expenditionary Airfield (EAF) personnel. These Marines are sent by "individual orders" because they are not attached to the ACE. Consequently, more per diem days will be incurred by 3rd MAW for FMFLANT CAXs.

The formal cost reports show no cost to 3rd MAW for air ammunition expended during CAXs 4-80 and 5-80. The adjusted cost reports reflect this air ammunition cost as calculated in Appendix A-19.

Actual POST-CAX costs for 3rd MAW are unknown because total cost for CAXs 4-80 and 5-80 were allocated equally to each of them in the formal cost reports. However, the $10,871 shown for Maintenance in the formal cost reports is incorrect. CG, 3rd MAW Message R 082212Z August 1980 specifies 3rd MAW reported POST-CAX Maintenance costs of $14,142 and POST-CAX Ops/Admin cost of $7,600 [7:2]. However, Ops/Admin is not allowed as a POST-CAX cost in the formal cost report, nor in the adjusted cost report. Instead of disallowing the $7,600

as a CAX cost, Maintenance costs were increased by this amount making them $21,742. This figure was then divided by two and allocated equally to CAXs 4-80 and 5-80, which distorts the true POST-CAX Maintenance costs. Since actual POST-CAX Maintenance cost was $14,142, the amount allocated to each CAX should have been $7,071. This corrected figure is reported in the adjusted cost reports.

The equipment 3rd MAW transported to the Combat Center for CAX 6-80 remained there through CAX 8-80, and actual maintenance costs for each separate CAX were not calculated. Instead, total maintenance and replen/repl costs for all three CAXs were reported at the conclusion of CAX 8-80, and amounted to $9,400 and $24,740 respectively. This is why the formal cost report for CAX 6-80 reflects no Maintenance or Replen/Repl cost. The adjusted cost reports for CAXs 6-80 and 7-80 has allocated one-third of the total Maintenance and Replen/Repl costs to 3rd MAW.

The adjusted cost report reflects the same Replen/Repl cost for CAXs 4-80 and 5-80 that are shown in the formal cost report.

F. CAC UNIT COST DIFFERENCES

The formal cost reports do not show the separate cost incurred by each unit of the CAC. They show only total figures for Maintenance of Equipment and Replen/Repl, and have also reported POST-CAX Training costs attributed to the CAC.

EXHIBITS 9-1, 9-4, 9-7, and 9-9 show the summarized POST-CAX costs by units of the CAC for CAXs 4-80 through 7-80, respectively. EXHIBIT 9-3 shows the specific breakdown of these costs as calculated by each unit of the CAC for CAXs 4-80 and 5-80. The authors could not obtain such a report for CAXs 6-80 and 7-80.

Notice from EXHIBIT 9-3 that CAC units calculated PRE-, DURING-, and POST-CAX costs for several different items. These costs have been summed and reported as a POST-CAX cost of the CAC, which means the formal cost reports for CAXs 4-80 and 5-80 reflect invalid figures for Combined Arms Command POST-CAX costs. One should note also that the units reported costs for wire, diesel, and lube oil; of which all are consumable items and should be a cost of the LSE, not the CAC. The cost shown for ordnance should not be included because the cost of ammunition is not a POST-CAX cost. Any ammunition expended after the CAX should not be counted as a CAX cost. DURING-CAX Maintenance costs are also a cost attributed to the LSE and should not be reported as a POST-CAX cost by units of the CAC.

From EXHIBITS 9-1, 9-4, 9-7, and 9-9, one can see the summarized POST-CAX costs for 4/11 for CAXs 4-80 through 7-80. From EXHIBIT 9-3 one can see that the $650 reported by 4/11 for Maintenance in CAX 4-80 is the sum of Maintenance and "Motor Transport Maintenance" in the amounts of $200 and $450, respectively. Of this $650, however, only $150 of the Motor

Transport Maintenance was actually a POST-CAX cost. The adjusted CAX 4-80 cost report reflects $150 as POST-CAX Maintenance cost for 4/11.

From EXHIBIT 9-3 one can see that the $6,024 reported by 4/11 as POST/CAX Replen/Repl cost in CAX 4-80 is the sum of all cost items excluding maintenance. Most of these items should not be reported as POST-CAX Replen/Repl costs. EXHIBIT 9-3 shows that 4/11 reported $609 as "Repl" cost in CAX 4-80, but reported it as a DURING-CAX cost. This is most likely a mistake as all replen/repl costs occur after the CAX. This figure is shown as a POST-CAX Replen/Repl cost to 4/11 in the adjusted cost report.

From EXHIBIT 9-3 one can see that no Maintenance or Replen/Repl costs were incurred by 4/11 in CAX 5-80. Therefore, none are shown in the adjusted cost report. The $1,378 reported by 4/11 as Replen/Repl was calculated by adding together the cost of wire, batteries, and administration. The $1,403 reported as Maintenance cost by 4/11 was calculated by summing the cost of gasoline, diesel, and lube oil. These are all consumable items and should have been charged to the LSE.

Since no breakdown of CAC costs by unit exists for CAX 6-80 and 7-80, the amounts reported in the summarized cost reports for the CAXs were taken at face value. 4/11 reported $870 as Maintenance cost in CAX 6-80, and also reported costs for Ops/Admin and POL. The only cost reflected in the adjusted cost report is the $870 for Maintenance. No Maintenance

or replen/repl costs were reported by 4/11 for CAX 7-80. Therefore, none are reflected in the adjusted cost report.

First Battalion, Fourth Marines reported costs correctly for CAXs 4-80, 5-80, and 6-80. Therefore, the costs appearing for 1/4 in the summarized cost reports for units of the CAC for these CAXs are the same costs that appear in the adjusted cost reports. In CAX 7-80, 1/4 reported $1,490 as Maintenance of Equipment cost and $990 as Replen/Repl cost. These same costs are reflected in the adjusted cost report. However, 1/4 also reported costs for Ops/Admin and POL which were added to the Replen/Repl cost in the formal cost report. These costs are not included in the adjusted cost report.

From EXHIBIT 9-3 one can see that in CAXs 4-80 and 5-80 CSC did incur Maintenance costs of $957 and $802 respectively, but incurred no Replen/Repl cost as shown in EXHIBIT 9-1 and 9-4. The Maintenance costs are reflected in the adjusted cost reports. All other costs shown to have been incurred by CSC in EXHIBIT 9-3 are cost of consumables and should have been incurred by the LSE. Reported costs for CSC in CAXs 6-80 and 7-80 are the same costs reflected in the adjusted cost report.

All maintenance and replen/repl costs were reported correctly by 3rd TK BN. The reason 3rd TK BN had such high maintenance cost for CAX 7-80 in relation to other CAXs is because several air cleaners, air cleaner boxes, and seals for air cleaner boxes has to be replaced on 3rd TK BN's vehicles in this CAX.

G. MCAGCC COST DIFFERENCES

The only MCAGCC unit that incurs PRE-CAX cost is the TEECG, which incurs cost for TAD to attend LOI conferences. The amount of TAD cost reported by MCAGCC for CAXs 4-80 through 7-80 corresponds to what the authors estimate should have been reported. Therefore no difference exists in the two reports concerning PRE-CAX costs.

MCAGCC incurs no DURING-CAX cost. Since none were reported by any MCAGCC unit, no difference exists between the formal and adjusted cost reports for MCAGCC DURING-CAX costs.

From EXHIBITS 9-2A and 9-5A, one can see that MCAGCC reported $10,500 POST-CAX Maintenance of Equipment costs and $5,000 Replen/Repl cost for CAXs 4-80 and 5-80. According to the Controller, MCAGCC, the $5,000 was reported as a cost of the Range Support Company (RSC) to repair the CAX training area and the $10,500 was a Maintenance cost of the EAP. The $5,000 is an estimated figure which was calculated by dividing RSC's annual budget of $50,000 by ten, and allocating it equally among the ten CAXs conducted during the year. This is improper because RSC repairs many training areas besides the one used for CAX training. Therefore, allocating the entire budget as a cost for CAX training does not reflect the true cost of repairing the CAX training range. Captain Olsen, Officer in Charge of Range Maintenance estimated the average cost to repair the CAX training range after CAX to be $943.

His calculations are shown in Appendix A-29. These figures are shown in the adjusted cost reports for CAXs 4-80 and 5-80 as a POST-CAX cost to the RSC for Range Repair. EXHIBIT 9-6A similarily shows an invalid $5,000 Replen/Repl cost for CAX 6-80 incurred by RSC. This fact was made known to the Controller, MCAGCC, and the correct cost of $943 was reported for CAX 7-80.

The $10,500 reported by the EAP may not reflect the actual cost of the EAP for CAXs 4-80 and 5-80 because they were back-to-back. When back-to-back CAXs are conducted, the EAP does not have enough turn-around time to calculate the cost it incurred during the first CAX separately from the cost it incurred during the second CAX. Therefore, at the conclusion of the second CAX, it simply divides the total cost for the two CAXs by two and allocates the costs equally between them. Furthermore, in the past, the EAP has submitted only total cost for the CAXs. A cost breakdown for the EAP would be helpful because the EAP also furnishes tents, water cans, and other such items which are easily lost of destroyed. These costs should not be reported as Maintenance of Equipment costs, but as Replen/Repl. Additionally, a cost breakdown would also show which items account for the majority of EAP costs which would be helpful for budgeting purposes. The $10,500 is shown as a POST-CAX cost of Maintenance of Equipment incurred by the EAP in the adjusted cost report.

In the formal cost report, MCAGCC reported $32,000 as Maintenance of Equipment cost for CAX 6-80. Again, this cost is attributed in total to EAP maintenance costs. Notice that this amount is three times as large as that reported for CAXs 4-80 and 5-80 because an unusual amount of damages was incurred from vehicles being wrecked and stripped. As previously stated, the entire amount probably should not be reported in total as a maintenance cost, but should be broken down between Maintenance of Equipment and Replen/Repl. Since no breakdown is available, the entire amount is shown as Maintenance of Equipment cost in the adjusted cost report. In CAX 7-80, $7,385 was reported for Maintenance of Equipment. As with previous CAXs, this amount should have been broken down. The adjusted cost report includes this $7,385 as Maintenance of Equipment cost.

H. COMMON-CAX COSTS

The adjusted cost reports show a COMMON-CAX cost category under which the TEECG and EAP incur costs. The costs incurred are their day-to-day operating costs to function as a unit, but are not direct costs of any particular CAX. Nonetheless, these are costs of the CATP. No COMMON-CAX costs are recorded in the adjusted cost report because COMMON-CAX costs have not been considered as a CATP cost in the past; therefore, no data exists to estimate their amount.

For cost reporting purposes, COMMON-CAX costs may be divided equally among the ten CAXs conducted during the year. The actual amount of COMMON-CAX cost will be unknown until the end of the fiscal year, but estimated amounts could be reported and then adjusted at the year's end. This would entail deducting the estimated amount of direct CAX costs from the annual budgets of the EAP and TEECG, and dividing the remaining portion of their budgets by ten to estimate the amount of COMMON-CAX costs to be allocated to each CAX.

I. SUMMARY

This chapter has shown the reported costs for CAXs 4-80 through 7-80 and the authors' estimate as to what costs should have been reported. The authors' estimated cost of the standard CAX will be presented in Chapter X.

UNIT	Replen/Repl	Maintenance	TOTAL
4/11	$ 6,024	650	$ 6,674
1/4	1,242		1,242
CSC	108	957	1,065
3rd TK BN	350	580	930
TOTAL	$ 7,724	$2,187	$ 9,911

EXHIBIT 9-1. Summarized CAC Cost by Unit for CAX 4-80.

	FSSG	3dMAW	1st Division	CAC	MCAGCC
# per diem days		25			5

PRE Costs	FSSG	3dMAW	1st Division	CAC	MCAGCC
Ops/Admin		3,900			252
Maintenance	2,264				
Training	9,371	6,334			
TAC AIR					
TOT/TOP		1,750	3,973		
Commercial Air					
Total	$11,365	$11,984	$3,973		252

DURING Costs	
Maint of Equip	
Ops/Admin*	83,434
Training	30,507
Med/Den	100
Other Log Supt	
Maint of ASE	
Total	$114,041

*Ops/Admin and Maintenance combined.

POST Costs	FSSG	3dMAW	1st Division	CAC	MCAGCC
Replen/Repl		27,790	4,830	7,724	5,000
Training	12,460				
Maint of Equip	3,169	10,871		2,187	10,500
TOT/TOP			1,986		
TAC AIR					
Commercial Air					
Total	$15,629	$38,661	$6,816	$9,911	$15,500

Total O&M,MC Cost = $228,132

O&MN Costs	
OFC's	$Amount(FMF PAC)
01	$191,088
50	205,540
21	
23	
Total	$396,628

Total Exercise Cost (O&M,MC + O&M,N) = $624,760

EXHIBIT 9-2A. Formal Cost Report for FMFPAC CAX 4-80.

Cost Component-Breakdown by Unit

UNIT	PRE	DURING	POST	COMMON
GCE	TAD ____ TOT ____ TOP 3,973	Ammo 561,796	Replen/Repl 4,803 Maint of Equip ____ TOT ____ TOP 1,986	
ACE (O&M,N) FMFLANT	TAD ____	Aircraft Fuel ____	Maint of Equip ____	
FMFPAC	TAD ____	Aircraft Fuel 191,088	Maint of Equip 205,540	
LSE	TOT 2,000 TOP ____	Med/Den 100 Maint of Equip 10,680 Consumables 96,200	Maint of Equip 3,169 Replen/Repl ____ TOT ____ TOP ____	
2nd MAW	TAD ____ TOT ____ TOP ____	Ammo ____	Replen/Repl ____ TOT ____ TOP ____	
3rd MAW	TAD 1,250 TOT 500 TOP 1,250	Ammo 127,095	Maint of Equip 7,071 Replen/Repl 27,790 TOT ____ TOP ____	
CAC 3rd TK BN	None	None	Maint of Equip 580 Replen/Repl 350	
1/4	None	None	Maint of Equip ____ Replen/Repl 1,242	
4/11	None	None	Maint of Equip 150 Replen/Repl 609	
CSC	None	None	Maint of Equip 957 Replen/Repl ____	
MCAGCC EAP	None	None	Maint of Equip 10,500 Replen/Repl ____	Ops Cost ____
RSC	None	None	Range Repair 943	
TEECG	TAD 252	None	None	Ops Cost ____

TOTAL CAX COST $ 1,261,874

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days				25	5

EXHIBIT 9-2B. Adjusted Cost Report for FMFPAC CAX 4-80.

Unit	CAX#	EE T Wire	EE T Batt	EE T Admin	EE T Maint	EE T Ord	EE T M.T.	EE T Repl	EE T Supp	EE T Ord	EE T M.T. Maint	EE V Mogas	EE V Diesel	EE V Lube	EE V Other/ Radios	TOTAL
4/11	PRE						300.00									
4-80	DUR	738.60	639.22	11.27	200.00	550.00	109.26	609.43	234.01	300.00	300.00	635.00	1,733.75	5.97	6.64	$6,673.76
	POS									150.00	150.00					
5-80	PRE											102.80	150.00			
	DUR											316.76	158.19	65.00		$2,780.89
	POS	500.00	678.12	200.00								75.00	139.00	405.00		
1/4	PRE															
4-80	DUR															$1,242.00
	POS							1,242.00								
5-80	PRE															
	DUR															$426.88
	POS				426.88											
Comm Supp	PRE														20.00	
4-80	DUR															$1,085.52
	POS	45.18	3.17	2.24	2.24						955.00				59.93	
5-80	PRE														20.00	
	DUR															$1,137.52
	POS	45.18	3.17		2.24						800.00	202.00			59.93	
3rd Tanks	PRE															
4-80	DUR															$930.00
	POS		50.00		580.00			350.00								
5-80	PRE															
	DUR															$875.00
	POS				530.00			345.00								

EXHIBIT 9-3. Breakdown of CAC Costs for FMFPAC CAXs 4-80 and 5-80.

UNIT	Replen/Repl	Maintenance	TOTAL
4/11	$ 1,378	$ 1,403	$ 2,781
1/4		427	427
CSC	128	1,009	1,137
3rd TK BN	345	530	875
TOTAL	$ 1,851	$ 3,369	$ 5,220

EXHIBIT 9-4. Summarized CAC Cost by Unit for CAX 5-80.

	FSSG	3rdMAW	1st Division	CAC	MCAGCC
# per diem days		25			5
PRE Costs					
Ops/Admin		3,900			252
Maintenance	5,372				
Training	4,972	6,334			
TAC AIR					
TOT/TOP		1,750			
Commercial Air					
Total	$10,344	$11,984			$ 252
DURING Costs					
Maint of Equip Ops/Admin*	59,218				
Training	40,602				
Med/Den	153				
Other Log Supt					
Maint of ASE					
Total	$99,793				

* Ops/Admin and Maintenance combined.

	FSSG	3rdMAW	1st Division	CAC	MCAGCC
POST Costs					
Replen/Repl		27,790	4,165	1,851	5,000
Training	499				-
Maint of Equip	827	10,871		3,369	10,500
TOT/TOP			5,678		
TAC AIR					
Commercial Air					
Total	$1,326	$38,661	$9,843	$5,220	$15,500

Total O&M,MC Cost = $192,923

O&M,N Costs:

OFC's	$Amount (FMFLANT)	$Amount (FMFPAC)
01		$ 235,500
50		190,842
21		
23		
Total		$ 426,342

Total Exercise Costs (O&M,MC + O&M,N = $ 619,265

EXHIBIT 9-5A. Formal Cost Report for FMFPAC CAX 5-80.

Cost Component-Breakdown by Unit

UNIT	PRE	DURING	POST	COMMON
GCE	TAD TOT TOP 1,986	Ammo 448,711	Replen/Repl 4,165 Maint of Equip TOT TOP 3,692	
ACE (O&M,N)				
FMFLANT	TAD	Aircraft Fuel	Maint of Equip	
FMFPAC	TAD	Aircraft Fuel 235,500	Maint of Equip 190,842	
LSE	TOT TOP	Med/Den 153 Maint of Equip 10,680 Consumables 96,200	Maint of Equip 827 Replen/Repl TOT 2,000 TOP	
2nd MAW	TAD TOT TOP	Ammo	Replen/Repl TOT TOP	
3rd MAW	TAD 1,250 TOT TOP	Ammo 198,013	Maint of Equip 7,071 Replen/Repl 27,790 TOT 500 TOP 1,250	
CAC				
3rd TK BN	None	None	Maint of Equip 530 Replen/Repl 345	
1/4	None	None	Maint of Equip 427 Replen/Repl	
4/11	None	None	Maint of Equip Replen/Repl	
CSC	None	None	Maint of Equip 802 Replen/Repl	
MCAGCC				
EAP	None	None	Maint of Equip 10,500 Replen/Repl	Ops Cost
RSC	None	None	Range Repair 943	
TEECG	TAD 252	None	None	Ops Cost

TOTAL CAX COST $1,244,429

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days				25	5

EXHIBIT 9-5B. Adjusted Cost Report for FMFPAC CAX 5-80.

	FSSG	3rdMAW	FMFLANT	CAC	MCAGCC
# per diem days		102	162		28

PRE Costs	FSSG	3dMAW	FMFLANT	CAC	MCAGCC
Ops/Admin		2,250	3,550		2,810
Maintenance	6,342				
Training					
TAC AIR			213,038		
TOT/TOP		750			
Commercial Air					
Total	$6,342	$3,000	$216,588		$2,810

DURING Costs	FSSG	3dMAW	FMFLANT	CAC	MCAGCC
Maint of Equip	12,799				
Ops/Admin*	52,426				
Training	29,719		2,710		
Med/Den	135				
Other Log Supt					
Maint of ASE					
Total	$95,059		$2,710		

* Ops/Admin and Maintenance combined.

POST Costs	FSSG	3dMAW	FMFLANT	CAC	MCAGCC
Replen/Repl					
Training	797		10,813	3,294	5,000
Maint of Equip	1,233			1,285 5	
TOT/TOP				5,950	32,000
TAC AIR			178,562		
Commercial Air					
Total	$2,030		$189,375	$10,529	$37,000

Total O&M,MC Cost = $565,443

O&M,N Costs:

OFC's	$Amount (FMFLANT)	$Amount (FMFPAC)
01	247,835	20,860
50	73,422	9,784
21	1,262	
23		
Total	$322,519	$30,644

Total Exercise Costs (O&M,MC + O&M,N) = $918,606

EXHIBIT 9-6A. Formal Cost Report for FMFLANT CAX 6-80.

Cost Component-Breakdown by Unit

UNIT	PRE	DURING	POST	COMMON
GCE	TAD 106 TOT TOP 213,038	Ammo 810,836	Replen/Repl 10,813 Maint of Equip TOT TOP 178,562	
ACE (O&M,N) FMFLANT	TAD 1,262	Aircraft Fuel 247,835	Maint of Equip 73,422	
FMFPAC	TAD	Aircraft Fuel 20,860	Maint of Equip 9,784	
LSE	TOT 2,000 TOP	Med/Den 135 Maint of Equip 12,799 Consumables 93,547	Maint of Equip 1,233 Replen/Repl TOT TOP	
2nd MAW	TAD 3,444 TOT TOP	Ammo 298,200	Replen/Repl TOT TOP	
3rd MAW	TAD 2,250 TOT 750 TOP	Ammo	Maint of Equip 3,133 Replen/Repl 8,247 TOT TOP	
CAC 3rd TK BN	None	None	Maint of Equip 374 Replen/Repl 344	
1/4	None	None	Maint of Equip 3,972 Replen/Repl 2,890	
4/11	None	None	Maint of Equip 870 Replen/Repl	
CSC	None	None	Maint of Equip 736 Replen/Repl 60	
MCAGCC EAP	None	None	Maint of Equip 32,000 Replen/Repl	Ops Cost
RSC	None	None	Range Repair 943	
TEECG	TAD 2,810	None	None	Ops Cost

TOTAL CAX COST $2,037,255

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days	5	60	162	102	28

EXHIBIT 9-6B. Adjusted Cost Report for FMFLANT CAX 6-80.

UNIT	MAINTENANCE	ADMIN/OPS	REPLEN/REPL	POL
COMM SUPT	735.00	123.00	60	-0-
4/11	870.00	790.00	-0-	195
3rd TANKS	374.00	-0-	344	177
1/4	3,971.00	-0-	2,890	-0-
TOTAL	$5,950.00	$913.00	$3,294	$372

EXHIBIT 9-7. Summarized POST-CAX Cost Report for Units of the CAC for FMFLANT CAX 6-80.

	FSSG	3rdMAW	FMFLANT	CAC	MCAGCC
# per diem days		102	157		

PRE Costs	FSSG	3dMAW	FMFLANT	CAC	MCAGCC
Ops/Admin	151	2,250	3,261		
Maintenance	4,386				
Training			116		
TAC AIR			178,561		
TOT/TOP		750			
Commercial Air					
Total	$4,527	$3,000	$181,938		

DURING Costs	FSSG	3dMAW	FMFLANT	CAC	MCAGCC
Maint of Equip	12,924				
Ops/Admin*	39,291				
Training	5,223		1,150		
Med/Den	153				
Other Log Supt					
Maint of ASE					
Total	$57,951		$1,150		

* Ops/Admin and Maintenance combined.

POST Costs	FSSG	3dMAW	FMFLANT	CAC	MCAGCC
Replen/Repl		8,247	17,800	5,645	943
Training					
Maint of Equip	2,093	3,133		6,555	7,385
TOT/TOP					
TAC AIR			463,441		
Commercial Air					
Total	$2,093	$11,380	$481,241	$12,200	$8,328

Total O&M, MC Cost = $763,807

O&M, N Costs:

OFC's	$Amount (FMFLANT)	$Amount (FMFPAC)
01	262,862	15,420
50	32,209	7,422
21	1,309	
23		
Total	$316,380	$22,842

Total Exercise Costs (O&M, MC + O&M, N) = $1,103,029

EXHIBIT 9-8A. Formal Cost Report for FMFLANT CAX 7-80.

UNIT	PRE	DURING	POST	COMMON
GCE	TAD ____ TOT ____ TOP 178,561	Ammo 540,544	Replen/Repl 17,800 Maint of Equip ____ TOT ____ TOP 463,441	
ACE (O&M,N)				
FMFLANT	TAD 1,309	Aircraft Fuel 262,862	Maint of Equip 32,209	
FMFPAC	TAD ____	Aircraft Fuel 15,420	Maint of Equip 7,422	
LSE	TOT ____ TOP ____	Med/Den 153 Maint of Equip 12,924 Consumables 53,938	Maint of Equip 2,093 Replen/Repl ____ TOT 2,000 TOP ____	
2nd MAW	TAD 3,261 TOT ____ TOP ____	Ammo 221,377	Replen/Repl ____ TOT ____ TOP ____	
3rd MAW	TAD 2,250 TOT 750 TOP ____	Ammo ____	Maint of Equip 3,133 Replen/Repl 8,247 TOT ____ TOP ____	
CAC 3rd TK BN	None	None	Maint of Equip 495 Replen/Repl 810	
1/4	None	None	Maint of Equip 1,490 Replen/Repl 990	
4/11	None	None	Maint of Equip ____ Replen/Repl ____	
CSC	None	None	Maint of Equip 830 Replen/Repl 180	
MCAGCC EAP	None	None	Maint of Equip 7,385 Replen/Repl ____	Ops Cost ____
RSC	None	None	Range Repair 943	
TEECG	TAD ____	None	None	Ops Cost ____

TOTAL CAX COST $ 1,842,817

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days		62	157	102	

EXHIBIT 9-8B. Adjusted Cost Report for FMFLANT CAX 7-80.

UNIT	MAINTENANCE	OPS/ADMIN	REPLEN/REPL	POL
COMM SUPT	830	5	180	
4/11		880		650
3rd TANKS	4235		810	710
1/4	1490	2340		70
TOTAL	$6555	$3,225	$990	$1430

EXHIBIT 9-9. Summarized POST-CAX Cost Report for Units of the CAC for FMFLANT CAX 7-80.

X. STANDARD COST OF CAX

The standard level of resources to be used in CAXs was developed in Chapter VIII. In this chapter the standard cost of a CAX, using the standard levels of resources developed in Chapter VIII, is estimated.

A. STANDARD COSTS FOR TAD

As can be seen from Appendix A-1 TAD costs may be incurred by the GCE, ACE (O&M, N funds), 2nd MAW, 3rd MAW, and the TÉECG. The standard TAD cost for each of these units may be estimated by using the following formula:

Std TAD Costs = Std number of per diem days x Std per diem rate.

Standard TAD costs, based upon the standard number of personnel shown in Appendix A-26, must be calculated for both FMFPAC and FMFLANT CAXs. This is done in the following paragraphs:

1. Standard TAD Cost for the GCE

Although the GCE may incur TAD costs, seldom does it do so. The reason is because personnel from the GCE are normally on field duty for the duration of the CAX, and thus do not incur TAD expense. When the GCE does incur this expense, it is usually a minimal amount, four to five days. This would occur when someone is sent to a CAX planning conference in preparation for the CAX. But normally the TEECG makes all necessary planning arrangements when they attend the

Letter of Instruction (LOI) conferences prior to each CAX. Because of this the standard TAD cost for the GCE is estimated to be zero for both FMFPAC and FMFLANT CAXs.

2. Standard TAD Cost for the ACE

TAD cost for the ACE is paid for with O&M,N funds because it is paid to pilots. When the ACE is furnished entirely by FMFPAC, TAD expense will normally not be incurred. The reason is because 3rd MAW sends the entire ACE to the Combat Center by "group orders" vice "individual orders." Therefore, the standard TAD cost for an ACE furnished entirely by FMFPAC is estimated to be zero.

When a FMFLANT CAX is conducted the ACE is furnished in part by FMFLANT and in part by FMFPAC. Fixed wing aircraft will normally be furnished by FMFLANT while helicopters will normally be furnished by FMFPAC.

This has not been the case for every CAX in the past, but because of high maintenance costs associated with flying helicopters from the East Coast to the West Coast, this policy is being stressed for future CAXs. Pilots from the East Coast do incur TAD expense because they are sent to the Combat Center by "individual orders." This is necessary because these pilots must fly their aircrafts from the East Coast and back again and may incur food and lodging expense along the way. CAXs 6-80 and 7-80 were both FMFLANT CAXs and the ACE reported TAD expense for the two CAXs in the amounts of $1,262 and $1,309, respectively. Although the cost report for these CAXs do not reflect the number of per

diem days incurred by the ACE, this number can be accurately estimated. Since the per diem rate at MCAGCC is the same for all East Coast personnel, whether paid by O&M,MC funds or by O&M,N funds, the TAD expense and number of per diem days reported by FMFLANT for CAXs 6-80 and 7-80 may be used to estimate the per diem rate for East Coast units. In CAX 6-80, FMFLANT reported 167 per diem days with TAD expense of $3,550. This calculates to $21.25 per per diem day. In CAX 7-80, FMFLANT reported 157 per diem days with TAD expense of $3,261. This calculates to $20.77 per per diem day. An average of these two figures is $21.00 per per diem day, and will be used as the standard per diem rate for estimating TAD costs for East Coast units. If the $1,262 and $1,309 reported as TAD expense for the ACE in CAXs 6-80 and 7-80 are divided by the $21 per diem rate, the resulting figures should be an accurate estimate of the number of per diem days incurred by the ACE for these two CAXs. This calculates to 60 per diem days and 62 per diem days for CAXs 6-80 and 7-80, respectively.

Now that a number of per diem days for these two CAXs is known, they may be compared to the number of pilots who incurred them. The number of pilots was 49 and 51 for CAXs 6-80 and 7-80, respectively [19:Encl(2) p. 1-2]. From this information one can see that the number of per diem days incurred per pilot may be used to estimate the number of per diem days that will be incurred for any given number of pilots. For example, the number of per diem days to have been incurred by the 51 pilots

that participated in CAX 7-80 could have been accurately estimated by multiplying this number by the number of per diem days incurred per pilot in CAX 6-80. This is illustrated below:

$$\frac{\text{60 per diem days}}{\text{49 pilots}} = \text{1.22 per diem days per pilot for CAX 6-80}$$

$$\text{51 pilots} \times 1.22 = \text{62.2 per diem days estimated for CAX 7-80}$$

The authors estimated the actual number of per diem days to have been incurred in CAX 7-80 to be 62. As can be seen the estimated amount of 62.2 is very close to this figure. However, the estimated number of per diem days may not always be this close to the actual number incurred. As explained in Chapter III, there will normally be favorable and unfavorable variances from standard. The method just illustrated may be used to estimate the number of per diem days to be incurred by East Coast ACEs for the standard number of personnel shown in Appendix A-26. Assuming that helicopters will be furnished by FMFPAC, the number of pilots from FMFLANT would be 26 when F-4s are used, or 21 when A-4s or AV-8s are used. The number of per diem days to be incurred by this many pilots may be estimated as follows:

per diem days per pilot	#pilots	estimated #per diem days
1.22	21	26
1.22	26	32

These figures will be used as the standard number of per diem days for the standard CAX recommended by the authors. The

standard TAD costs for the ACE in a FMFLANT CAX may now be calculated as follows:

Std #per diem days x Std per diem rate = Std TAD costs

When F-4s are used:

32 per diem days x $21/per diem day = $672
Std TAD cost.

When A-4s or AV-8s are used:

26 per diem days x $21/per diem day = $546
Std TAD cost.

3. Standard TAD Cost for 2nd MAW

Second Marine Aircraft Wing incurs TAD cost for non-pilot officers that are part of the ACE. Because these officers are not pilots, O&M,MC funds are used to pay for their TAD expense.

In CAX 6-80, FMFLANT reported 167 per diem days, of which 162 were incurred by 2nd MAW. In CAX 7-80 FMFLANT reported 157 per diem days, all incurred by 2nd MAW. In CAX 6-80, 63 officers were in the ACE, of which 49 were pilots and 14 were non-pilots [19:Encl(2)P.1]. With this data one may relate the number of per diem days incurred by 2nd MAW to the number of non-pilot officers sent with the ACE.

The average number of per diem days incurred per non-pilot officers is calculated below for CAXs 6-80 and 7-80:

CAX	#per diem days	#officers	#per diem days/officer
6-80	162	14	11.6
7-80	157	14	11.2

Avg #per officer = 11.4

The average number of per diem days incurred per non-pilot officer may now be used to estimate the standard number of

per diem days that will be incurred by the standard number of non-pilot officers shown in Appendix A-26. This is done below:

Avg #per diem days	Std #NON-PILOT OFF	Std #per diem days
11.4	15	171

The standard TAD costs for 2nd MAW may now be calculated:

Std #per diem days	Std per diem rate	Std TAD Costs
171	$21	$3,591

4. Standard TAD Cost for 3rd MAW

Third Marine Aircraft Wing incurs TAD costs for both FMFPAC and FMFLANT CAXs. When a FMFPAC CAX in conducted 3rd MAW incurs TAD expense for the ACE staff to attend LOI conferences. When a FMFLANT CAX is conducted 3rd MAW incurs TAD expense for both non-pilot officers and enlisted men who are sent to the Combat Center to augment the FMFLANT ACE. The reason is that personnel must be sent by "individual orders" vice "group orders" when they are augmenting a FMFLANT ACE. Therefore, 3rd MAW will incur more per diem days for a FMFLANT CAX than for a FMFPAC CAX.

CAXs 4-80 and 5-80 were back-to-back FMFPAC CAXs, for which a total of 50 per diem days were incurred. These per diem days were incurred by the ACE staff and were allocated equally to each CAX for cost reporting purposes. The number of per diem days incurred by 3rd MAW varies only slightly from one FMFPAC CAX to the next. Therefore, 25 per diem days is estimated to be the standard number of per diem days to be incurred by 3rd MAW in FMFPAC CAXs. According to the Controller,

MCAGCC, these per diem days are incurred at Camp Pendleton at a per diem rate of $50 per per diem day. Therefore, the standard estimated TAD cost for 3rd MAW in FMFPAC CAXs is $1,250.

As explained earlier, 3rd MAW will incur considerably more per diem days for FMFLANT CAXs than for FMFPAC CAXs. CAXs 6-80 and 7-80 were back-to-back FMFLANT CAXs for which 3rd MAW incurred a total of 204 per diem days, 14 for officers and 190 for enlisted men. For purposes of cost reporting these per diem days were allocated equally to each CAX. The total TAD expense reported for these per diem days was $4,500; $2,250 allocated to each CAX. The number of non-pilot officers who incurred this TAD expense was five, and the number of enlisted men was 19, all of whom were sent to augment the Expeditionary Airfield personnel. This calculates to 2.8 per diem days per officer, and 10 per diem days per enlisted man. These figures may be used to estimate a standard number of per diem days for 3rd MAW in FMFLANT CAXs based on the standard number of personnel that would be sent to augment the Expeditionary Airfield personnel. The number of Marines 3rd MAW sends for this augmentation is normally about five officers and twenty enlisted regardless of how many helicopters 3rd MAW provides. These figures may be used to estimate the standard number of per diem days to be incurred by non-pilot officers and enlisted men provided by 3rd MAW for FMFLANT CAXs:

Avg #per diem days/Marine	#Marines	Std #per diem days
2.8 (Officer)	5	14 (Officers)
10.0 (Enlisted)	20	200 (Enlisted)

Now that standard numbers of per diem days have been calculated, they may be used to estimate standard TAD costs for 3rd MAW in FMFLANT CAXs:

Std #per diem days	Std per diem rate	Std TAD costs
14 (Officer)	$16.65	$ 233(Officer)
200 (Enlisted)	7.50	1,500(Enlisted)

The estimated standard TAD costs for 3rd MAW total to $1,733. The standard per diem rates were obtained from the Controller, MCAGCC. They are the per diem rates for West Coast personnel at the Combat Center. The reason 3rd MAW's TAD expense was more than this for CAXs 6-80 and 7-80 is because military quarters were not available for all personnel. The per diem rate is $50 per per diem day when Marines stay in motels. The Controller, MCAGCC, stated that military quarters will normally be available.

5. Standard TAD Cost for TEECG

The TEECG incurs TAD expense for Letter of Instruction (LOI) conferences prior to the beginning of each CAX. A total of ten per diem days were incurred for CAXs 4-80 and 5-80, which were allocated equally to each CAX for cost reporting purposes. These per diem days were incurred by ten officers from the TEECG, which calculates to .5 per diem days per officer. According to the Controller, MCAGCC, ten officers is the usual number of personnel that are sent to LOI conferences by the TEECG. Therefore, five per diem days (ten officers at .5 per diem days per officer) is the estimated standard number of per diem days for TEECG personnel. The standard per diem rate for TEECG personnel for FMFPAC LOI conferences is $50 per per

diem day. The standard TAD expense for the TEECG may now be calculated:

Std # per diem days	Std per diem rate	Std TAD Cost
5 (FMFPAC CAX)	$50/per diem day	$ 250

A total of 28 per diem days were incurred by the TEECG for CAXs 6-80 and 7-80, however, they were all reported in the CAX 6-80 cost report. Again, ten officers were sent to the East Coast LOI conferences for these two FMFLANT CAXs, which calculates to 2.8 days per officer for two CAX LOI conferences, or 1.4 days per officer per conference. A total of $2,810 was reported in TAD expense for these 28 per diem days which calculates to $100.35 for each per diem day that was incurred. The Controller, MCAGCC, stated that $100 is an accurate estimate of the cost for each per diem day incurred by TEECG personnel sent to East Coast LOI conferences. Therefore, $100 will be used as the standard per diem rate for per diem days incurred by the TEECG for FMFLANT LOI conferences.

The standard number of per diem days for a FMFLANT CAX may be calculated as follows:

#per diem days/officer	Std #officers	Std #per diem days
1.4	10	14

The standard TAD costs to be incurred by the TEECG for FMFLANT CAXs may now be calculated:

Std #per diem days	Std per diem rate	Std TAD Cost
14	$100	$1,400

B. STANDARD COSTS FOR TOP

As can be seen from EXHIBIT 6-1 TOP costs are incurred by the GCE, LSE, 2nd MAW, and 3rd MAW. The TOP costs will vary depending on the mode of transportation that is used. For purposes of this thesis, the mode of transportation is assumed to be commercial bus for West Coast units and military airlift for East Coast units. Standard TAD costs, based upon the standard number of personnel shown in Appendix A-26, must be calculated for both FMFLANT and FMFPAC CAXs. This is done in the following paragraphs:

1. Standard TOP Cost for the GCE and 2nd MAW

The standard number of personnel for the GCE is 1,170, 51 officers and 1,119 enlisted men, as is shown in Appendix A-26. On the West Coast, buses with drivers are chartered by the hour [16:4-108]. The following rates apply:

a. 38 - passenger bus - $181.25 for five hours or less, each additional hour is $21.71.

b. 43 - passenger bus - $188.75 for five hours or less, each additional hour is $22.65.

c. 46 - passenger bus - $196.25 for five hours or less, each additional hour is $23.55.

Less than five hours are needed to drive from Camp Pendleton to the Combat Center. Based on the standard number number of personnel for the GCE, 27 buses (43 passenger capacity) would be needed to transport the GCE from Camp Pendleton to the Combat Center, assuming that the entire GCE is transported at

the same time. This standard number of buses may be multiplied by the standard price per bus to estimate the standard TOP cost for the GCE for FMFPAC CAXs:

Std # buses	Std price per bus	Std TOP cost
27	$188.75	$5,096

This cost is for a one-way trip. The same cost is assumed for the return trip.

The cost for transporting the same number of personnel from the East Coast is many times higher than the cost of transporting them from the West Coast. The reason is that troops from the East Coast are flown to the Combat Center by military airlift which is very expensive.

The GCE and the ACE (troops and non-pilot officers) are flown together from Cherry Point, North Carolina to the Combat Center. The number of ACE personnel transported by military airlift is as follows:

Component	# Officers	# Enlisted	Total
Fixed Wing	8	129	137
Helicopters	0	0	0
Air Contingency	14	157	171
TOTAL	22	286	308

The eight officers for the fixed wing component are the additional flight crews that are included in the standard number of personnel in Appendix A-26, based upon the assumption that F-4s are used since more officers are needed in that case. Since helicopters are assumed to be furnished by FMFPAC, no helicopter personnel will be flown from the East Coast.

Adding the 308 ACE personnel (provided by 2nd MAW) with the 1,245 GCE personnel gives a total of 1,478 Marines to be airlifted to the Combat Center. The GCE will be attributed 79 percent (1170 ÷ 1478) and 2nd MAW will be attributed 21 percent (308 ÷ 1478) of this total transportation cost. A C-141 aircraft will seat approximately 160 people, which means nine flights would be necessary to transport 1478 marines from Cherry Point to the Combat Center. The Marine Corps Cost Factor Manual specifies that a one-way C-141 flight with the aircraft returning to its basing point is $33,090 (16:4-93). Using the standard number of flights and the standard price per flight, the standard TOP cost to be incurred by the GCE and 2nd MAW for FMFLANT CAXs may be estimated:

Std # flights	Std price per flight	Std TOP cost
9	$33,090	$297,810

This is the cost for a one-way trip. The same cost is assumed for the return trip.

2. Standard TOP Cost for the LSE

The LSE is provided by the First Service Support Group, located at Camp Pendleton, for both FMFLANT and FMFPAC CAXs. The standard number of personnel for the LSE is 242, 12 officers and 232 enlisted men, as is shown in Appendix A-26. However, TOP expense will not be incurred for all 242 men. The LSE makes up for any deficiencies in equipment that cannot be provided by the EAP. EXHIBIT 10-1 shows the items that cannot be provided by the EAP if the standard equipment package (Appendix A-3) is used. A total of 25 vehicles are listed in this exhibit which

TAM #	NOMEN	Std #	#On Hand at EAP	DEFICIENCY
A0265	MRC 87	3	1	2
A1930	MRC 110	2	0	2
A2183	MRC 135	2	0	2
B0440	Crane,M65	2	0	2
B0630	Floodlight Unit	4	3	1
B0730	Gen,3KW,60 hz	4	2	2
B0891	Gen,10KW,60hz	3	0	3
B1224	RKT Launcher	1	0	1
B1700	630 Cu.Reefer	3	1	2
C4000	A Pack, Field Rng	12	0	12
C4436	Water Can	300	250	50
C4776	Fire Ext,30H	7	0	7
C4870	Fly Tent	10	6	4
C4880	Food Container	40	37	3
C4980	Immersion Heater	30	24	6
C6390	C.P.Tent	21	6	15
D0215	Trlr Refueler	2	0	2
D0260	Trlr,M127	1	0	1
D0840	Trlr,M416	37	0	37
D0850	Trlr,M101	8	7	1
D0860	Trlr,M105	14	0	14
D0880	Trlr,M149	11	9	2
D0890	TRK,Amb M718	3	1	2
D1015	TRK,M880	4	0	4
D1030/40	TRK,6x6,2-1/2T	29	23	6
D1130	TRK,M52AZ	2	1	1
D1160	TRK,M151	41	29	12

EXHIBIT 10-1. Items of Standard Equipment Package That Can't be Furnished by the EAP.

must be driven to the Combat Center by the LSE. According to the Controller, FSSG, approximately one-third of the LSE personnel accompany these vehicles in their journey to the Combat Center. This calculates to 81 Marines or 3 Marines per vehicle for the 25 vehicles the LSE must bring. This leaves 161 Marines to be transported by commercial bus. Assuming they are transported together 4 buses would be needed, three with a capacity of 43 or 46 passengers and one with 38 passenger capacity for the remaining personnel. The assumed combination is three buses with 43 passenger capacity and one with 38 passenger capacity since this combination is cheapest. Therefore, the standard TOP cost for the LSE may be calculated as shown below:

Std # buses	Std price per bus	Std TOP cost
3	$188.75	$566.25
1	181.25	181.25
	Total Std TOP Cost	$747.50

This is the cost for a one-way trip. The cost for the return trip is assumed to be the same.

3. Standard TOP Cost for 3rd MAW

The standard number of personnel for the ACE is 434 Marines, as shown in Appendix A-26, when F-4s are used. When AV-8s or A-4s are used it is slightly less. However, only OV-10s and helicopters from 3rd MAW operate out of the expeditionary airfield (EAF) at MCAGCC. All other aircraft operate out of Marine Corps Air Station, El Toro, California. Therefore, the only personnel who must be transported to the Combat Center are the additional flight crews for the OV-10s and helicopters,

the enlisted personnel for these detachments, and all personnel of the Air Contingency Component. This calculates to the numbers of Marines shown below:

Component	# Marines
Additional Pilots (OV-10s)	2
Additional Pilots (Helos)	8
Enlisted Men (OV-10s)	19
Enlisted Men (Helos)	78
Air Contingency	171
TOTAL	278

Six buses, of 46 passenger capacity, are needed to transport this many Marines. The trip to the Combat Center from El Toro is less than five hours, so the prices are the same as those shown earlier for transporting personnel to the Combat Center from Camp Pendleton. The standard TOP cost for 3rd MAW in a FMFPAC CAX is calculated as follows:

Std # Buses	Std price per bus	Std TOP cost
6	$196.25	$1,177.50

This is the cost for a one-way trip. The return trip is assumed to be the same.

C. STANDARD COSTS FOR TOT

As can be seen from Appendix A-1, TOT costs are incurred by the GCE, LSE, 2nd MAW, and 3rd MAW.

1. Standard TOT Costs for the GCE

Although TOT is a legitimate PRE-CAX cost for the GCE, normally it will not be incurred. Normally the LSE is tasked with the responsibility of transporting equipment deficiencies.

Therefore, no standard cost of TOT for the GCE is calculated.

2. Standard TOT Costs for 2nd MAW

Although 2nd MAW may legitimately incur TOT costs, normally it will not. Second Marine Aircraft Wing is located on the East Coast and the cost to transport equipment from the East Coast is very expensive. Therefore, if additional aviation support equipment is needed it will normally be provided by 3rd MAW. Because of this, no standard cost of TOT for 2nd MAW is calculated.

3. Standard TOT Costs for 3rd MAW

Third Marine Aircraft Wing has incurred TOT costs for both FMFLANT and FMFPAC CAXs in the past. This TOT cost has been the cost of transporting EAP deficiencies to the Combat Center. No data has been kept as to how much equipment 3rd MAW has transported in previous CAXs, nor the number and types of vehicles that were used to do so. The authors have assumed that the LSE will transport all EAP deficiencies to the Combat Center, and would be the only unit incurring TOT cost. This may or may not be the case depending on the amount of equipment the EAP is capable of providing for each individual CAX.

4. Standard TOT Cost for the LSE

The LSE will incur TOT expense for both FMFLANT CAXs and FMFPAC CAXs. The LSE normally is the unit that makes up for equipment deficiencies of the EAP. EXHIBIT 10-1 shows equipment deficiencies of the EAP for the standard equipment

package shown in Appendix A-3. The first two columns lists the Table of Authorized Material Number and the nomemclature of items for which the EAP has a deficiency. The third column lists the quantity of each item that is called for in the standard equipment package, and the fifth column lists the actual quantity on hand at the EAP. The last column is the "deficiency" column found by subtracting column four from column three. The number shown on the deficiency column is the quantity of these items which the LSE must transport to the Combat Center.

From EXHIBIT 10-1, one can see that the EAP is deficient by 25 trucks (D0890 through D1160). The TOT cost of the LSE is essentially the cost of fuel to drive these vehicles to and from the Combat Center. Most of the other items may be towed or carried in the 25 vehicles. Estimated miles per gallon ratings were obtained for each of these types of vehicles from Wing Transport Squadron-37, 3rd MAW. Based on a distance of 150 miles from Camp Pendleton to the Combat Center a standard number of gallons of fuel to be used has been estimated and shown as EXHIBIT 10-2. Using these standard quantities for fuel consumption, the standard TOT costs for the LSE may be estimated:

TYPE FUEL	STD QUANTITY	STD PRICE/GAL	STD FUEL COST
Gasoline	190.2 gals	$1.26	$239.65
Diesel	358.35 gals.	$1.29	$462.27
		Std TOT Cost	$701.92

This is the cost for a one-way trip. The return trip is assumed to cost the same.

TAM#	Type Fuel	#Miles	MPG	#Gals/ Vehicle	#Vehicles	Std #Gals
D0890	G	150	8.0	18.75	2	37.5
D1015	G	150	5.2	28.8	4	115.2
D1030/ 40	D	150	3.4	44.1	6	264.6
D1130	D	150	1.6	93.75	1	93.75
D1160	G	150	8.0	18.75	12	37.5

Standard Quantity Gasoline = 190.2 gallons

Standard Quantity Diesel = 358.35 gallons

EXHIBIT 10-2. Standard Amount of Fuel Consumed by the LSE in Transporting Equipment to the Combat Center.

D. STANDARD MAINTENANCE COSTS

As can be seen from Appendix A-1, Maintenance of Equipment is a legitimate DURING-CAX cost of the LSE; and is a legitimate POST-CAX cost of all units except the TEECG, RSC, and 2nd MAW.

1. Standard Maintenance Cost for the EAP

The EAP has incurred significant amounts of maintenance cost in previous CAXs. The total cost of maintenance for CAXs 4-80 and 5-80 was reported as $21,000 and was allocated equally to the two CAXs. The costs for CAXs 6-80 and 7-80 were $32,000 and $7,385 respectively. As explained in Chapter IX, maintenance costs for CAX 6-80 were extremely high and are not representative of the normal EAP Maintenance of Equipment cost. Therefore, the CAX 6-80 Maintenance of Equipment costs cannot be used in developing a cost estimating relationship for EAP Maintenance of Equipment costs. This leaves only the Combined Maintenance of Equipment cost for CAXs 4-80 and 5-80, and the Maintenance of Equipment cost for CAX 7-80 that may be used to build a cost estimating relationship. The reliability of a cost estimating relationship that is built with such limited information is questionable.

The bulk of EAP Maintenance of Equipment cost is the cost of providing maintenance to the EAP's trucks, jeeps, and other fuel consuming items. Therefore, one would expect Maintenance of Equipment costs to vary with the number of gallons of fuel consumed, vehicle mileage, or hours of operation. The number of gallons of fuel consumed is available, but mileage

and hours of operation are not. As can be seen from Appendix A-6 the total number of gallons of fuel consumed DURING the CAX for CAXs 4-80 and 5-80 was 77,955 gallons. The total EAP Maintenance of Equipment cost for these two CAXs was $21,000. This calculates to $.27 of EAP Maintenance of Equipment cost for each gallon of fuel consumed. In CAX 7-80 28,594 gallons were consumed with an EAP Maintenance of Equipment cost of $7,385. This calculates to $.255 of EAP Maintenance for each gallon of fuel that was consumed, which is close to the $.27 per gallon consumed for CAXs 4-80 and 5-80. Of course these calculations may be close merely by coincidence. One cannot know for certain based on the limited number of observations. Intuitively, however, the cost of EAP equipment maintenance should vary with the quantity of fuel that is consumed by that equipment. The authors have assumed that it does and have assigned the average cost of Maintenance per gallon of fuel consumed for CAXs 4-80, 5-80, and 7-80 as the standard price for EAP Maintenance of Equipment costs, which calculates to $.2625 of EAP Maintenance for each gallon of fuel consumed. From Appendix A-9 one can see that the standard quantity of fuel for the standard equipment package has been estimated to be 50,952 gallons. With this information the standard Maintenance of Equipment cost for the EAP may be estimated:

Std Fuel Consumption	Std Maint Cost/Gal	Std EAP Maint Cost
50,952 gallons	$.2625	$13,375

If one disagrees with the methodology used in calculating this standard EAP Maintenance of Equipment Cost, perhaps the actual amounts and types of equipment used in past CAXs could somehow be related to the maintenance costs that were incurred for those CAXs. These relationships may then possibly be used to estimate the Maintenance of Equipment costs for various levels and combinations of equipment. The only information available to the authors was the types and amounts of equipment requested for previous CAXs. According to MCAGCC's Installation and Logistics Unit the types and amounts requested seldom are the same as the types and amounts actually used. Therefore, the authors could not use this method to estimate maintenance of equipment cost. However, the method that was used is simpler than the alternate method just described, and should be just as accurate. Fuel consumption by equipment is a good indicator of how much the equipment was actually used.

Two additional things that have an impact upon EAP Maintenance of Equipment Costs should be addressed at this time. They are the impact of back-to-back CAXs upon the EAP and the shortage of EAP personnel.

Back-to-back- CAXs were initiated so that transportation costs to and from the Combat Center could be reduced. For example, when back-to-back CAXs are conducted the LSE does not return to Camp Pendleton at the conclusion of the first CAX. Instead, it remains at the Combat Center and provides support to

the second CAX. Therefore, two CAXs will have been conducted but the LSE will have traveled to the Combat Center and back only one time. To a certain extent this is done for all the participating units except the GCE.

Undoubtedly, back-to-back CAXs have reduced transportation costs; although the actual amount of the reduction is unknown. However, no decision should be made without first considering both the positive and negative repercussions the decisions will have. The EAP has suffered negative repercussions from back-to-back CAXs.

The EAP suffers an extremely high deadline rate (80 percent) on returned equipment which prevents a speedy turn around of equipment for a second CAX [12:1]. Normally, for back-to-back CAXs, one or two days are all that is alloted for turn-in and reissue of equipment [12:1]. Consequently, the EAP is forced to reissue equipment without having provided it with adequate maintenance; which causes EAP equipment to deteriorate at a faster rate. This causes maintenance costs to rise because as the equipment deteriorates an increased amount of higher level maintenance is necessary. The long run effect of this is that EAP equipment will have to be replaced at a faster rate, and an increased amount of equipment will have to be transported to Combat Center by the participating units. This tends to offset any cost savings that might initially result from back-to-back CAXs. The authors are of the opinion that back-to-back CAXs

should be discontinued until their cost effectiveness has been analyzed.

The EAP has an extremely difficult time performing its mission because of significant personnel shortages. EXHIBIT 10-3 shows the number of personnel broken down by Military Occupational Specialty (MOS) which the EAP rates by Table of Organization and the number of personnel in each MOS that is actually on hand. As can be seen from the exhibit the EAP is extremely short of mechanics of all type. This is another reason the EAP has difficulty in providing adequate equipment maintenance and why back-to-back CAXs impose an impossible situation upon this unit. The present philosophy is that the EAP will eventually be provided with enough equipment so that no participating unit will have to bring outside equipment to the Combat Center. Until the EAP's problem of personnel shortage has been solved, adding some more equipment to the EAP will only compound an already impossible situation. This is also an area in which further study would be helpful.

2. <u>Standard Maintenance Cost for the LSE</u>

The LSE incurs both DURING-CAX and POST-CAX Maintenance of Equipment costs. However, the available data that may be used to estimate these costs is scarce and its reliability is questionable. Recall that in CAXs 4-80 and 5-80 actual Maintenance of Equipment costs were not reported, but were included in the figures reported for OPS/Admin along with other expenses.

Billet Description	Rank	MOS	# On Hand	# Rated by T/O	# Deficient
Branch Head	Maj	0402	1	1	0
Ops Chief	MSGT	3537	1	1	0
MIMMS Librarian	SGT	0441	1	1	0
Supply Chief	GySGT	3043	0	1	1
Supply Admin Man	SSGT	3043	1	1	0
Stock Records Clerk	CPL	3043	2	2	0
Stock Records Clerk	LCPL	3043	0	2	2
Gen Warehouse Man	SGT	3051	2	1	+1
Gen Warehouse Man	LCPL	3051	0	1	1
Fabric Repair Spec	LCPL	1181	0	1	1
Motor Trans Officer	LT	3510	1	1	0
MT Maint/Roadmaster	SSGT	3529	1	1	0
Auto Mech	SGT	3521	1	2	1
Auto Mech	CPL	3521	5	3	+2
Auto Mech	LCPL	3521	2	16	14
Motor Veh Operator	CPL	3531	2	2	0
Motor Veh Operator	LCPL	3531	2	7	5
Engineer Chief	GySGT	1349	0	1	1
Engineer Mech	SGT	1341	0	2	2
Engineer Mech	CPL	1341	0	1	1
Engineer Mech	LCPL	1341	1	2	1
Generator Mech	CPL	1142	0	2	2
Generator Mech	LCPL	1141	0	2	2
Refrig Mech	LCPL	1161	2	2	0
Artillery Repairman	SGT	2131	1	1	0
Comm Chief	SGT	2531	0	1	1
Radio Operator	LCPL	2531	0	1	1

Total Personnel Shortage = 31 Marines

EXHIBIT 10-3. EAP Personnel Deficiencies by Billet, Rank, and MOS.

Therefore, the authors had to estimate Maintenance of Equipment costs for these CAXs to be included in the adjusted cost reports. Because of the back-to-back nature of these two CAXs the estimated amount was allocated equally to each of them. One could calculate a Maintenance of Equipment cost per gallon of fuel consumed, as was done for EAP Maintenance of Equipment cost, but the validity of this calculation would be questionable since the LSE's actual DURING-CAX Maintenance of Equipment cost is unknown.

The LSE did report DURING-CAX Maintenance of Equipment costs separately for CAXs 6-80 and 7-80. The reported cost and the gallons of fuel consumed for these two CAXs are shown below:

CAX	MAINTENANCE OF EQUIPMENT COST	FUEL (GALLONS)
6-80	$12,799	36,299
7-80	$12,924	28,594

As can be seen, the reported cost for CAX 7-80 was higher than in CAX 6-80, yet significantly fewer gallons of fuel were consumed in CAX 7-80. These reported costs are also somewhat questionable due to the back-to-back nature of the CAXs. The controller, FSSG, indicates that although an attempt to separate the cost of each CAX is made, actually doing so is difficult because the costs of the first CAX carries over into the second CAX because of the short turn around time between them. Therefore, the point at which costs of the first CAX stops and the cost of the second CAX begins is difficult to determine. However, they have been reported as accurately as is possible for back-to-back CAXs.

Taking these results at face value one might conclude that fuel consumption should not be used to predict DURING-CAX Maintenance of Equipment cost. However, because equipment does not receive an adequate amount of maintenance before being re-issued for use in the second CAX, the DURING-CAX Maintenance of Equipment costs may have a tendency to be higher for the second CAX than they were for the first. Indeed, this was the case for CAXs 6-80 and 7-80. Although the reported cost for CAX 7-80 was only $125 higher than that reported for CAX 6-80, fuel consumption for CAX 7-80 was 7705 gallons less than fuel consumption for CAX 6-80. Based on fuel consumption this indicates that equipment was used approximately 21 percent less in CAX 7-80 than in CAX 6-80, yet maintenance cost to this equipment was $125 more. Calculating a maintenance cost per gallon of fuel consumed yields a cost of $.35 per gallon for CAX 6-80 and a cost of $.45 per gallon for CAX 7-80, an increase of 29 percent in maintenance of equipment cost per gallon of fuel consumed. This indicates that equipment in the second CAX incurred an increased amount of dead-line time so that necessary maintenance could be provided. The Officer in charge of the EAP, and officers of the Combat Center's Installation and Logistice Unit, have verified that generally DURING - CAX maintenance for back-to-back CAXs does increase in the second CAX, but that the degree of this increase is unknown.

The authors are of the opinion that fuel consumption can validly be used to estimate DURING - CAX Maintenance of Equipment costs. Of course this cannot be concluded with certainty until data from more CAXs becomes available. However, until more data is available one must make the best estimate possible based on the limited information that is available. Therefore, the authors have assigned $.35 per gallon of fuel consumed DURING the CAX as the standard cost of DURING - CAX Maintenance of Equipment to be incurred by the LSE. This estimate is somewhat low, although the actual degree is unknown. The reason is that had the CAXs not been back-to-back, maintenance performed after the first CAX would have been more thorough. As more information is available, a more accurate average price per gallon of fuel consumed may be calculated.

Using the standard amounts of fuel to be consumed shown in Appendix A-9, the standard DURING-CAX Maintenance of Equipment cost may be estimated:

Std FUEL CONSUMPTION	Std MAINT COST/GAL	Std DURING MAINT COST
50,952 gallons	$.35	$17,833

This is higher than has been reported in previous CAXs. However, one must remember that this is the estimated standard cost for the Standard Equipment Package recommended by the authors. A different mix of equipment would yield a different amount of fuel to be consumed which would in turn yield a different standard DURING - CAX Maintenance of Equipment cost.

The LSE also incurs POST-CAX Maintenance of Equipment costs. Following the same methodology used thus far, a standard POST-CAX Maintenance of Equipment cost per gallon of fuel consumed may be estimated. This is done below for the reported LSE POST-CAX Maintenance of Equipment cost in CAXs 4-80 through 7-80, and the amount of fuel consumed in these CAXs taken from Appendix A-6:

CAX	POST-MAINT COST	FUEL CONSUMPTION	POST MAINT COST/GAL
4-80 & 5-80	$3,966	77,955 gals	$.05/gal
6-80	$1,233	36,299 gals	$.034/gal
7-80	$7,422	28,594 gals	$.26/gal

The resulting cost per gallon consumed for CAXs 4-80 and 5-80 is fairly close to the one resulting for CAX 6-80. However, the resulting cost per gallon consumed for CAX 7-80 is once again significantly higher. The authors attribute this increase to the same causes explained for the increase in the LSE's during - CAX Maintenance of Equipment cost in CAX 7-80. Recall also that in CAX 6-80 an unusually high amount of equipment damage was incurred which caused EAP Maintenance of Equipment cost for that CAX to triple. If the LSE also incurred similar damage to the equipment it furnished for the CAX, the most seriously damaged equipment probably could not be repaired until the LSE returned to Camp Pendleton and proper facilities were available. This means that the maintenance to this equipment would not have been provided until after CAX 7-80 was conducted. For these reasons the POST Maintenance

of Equipment costs reported by the LSE for CAX 7-80 are not considered to be reflective of the normal amount that will be incurred. Therefore, the LSE's estimated standard POST-CAX Maintenance of Equipment is based on the average cost per gallon of fuel consumed in CAXs 4-80 and 5-80 and 6-80, which calculates to $.042 per gallon of fuel consumed during the CAX. The estimated standard fuel consumption shown in Appendix A-9 may now be used to estimate the standard POST-CAX Maintenance of Equipment cost for the LSE:

Std Fuel Consumption	Std Maint Cost/Gal	Std POST Maint Cost
50,952	$.042	$2,140

3. Standard Maintenance Cost for the GCE

Although Maintenance of Equipment is a legitimate POST-CAX cost of the GCE, normally it will not incur this expense. Notice that up POST-CAX Maintenance costs were incurred by the GCE in CAXs 4-80 through 7-80. The reason is that equipment deficiencies are normally provided by the LSE. Therefore, the standard POST-CAX Maintenance of Equipment cost for the GCE is estimated to be zero.

4. Standard Maintenance Cost for 3rd MAW

Third Marine Aircraft Wing incurs POST-CAX Maintenance of Equipment cost for the aviation support equipment it provides for each CAX. The reported costs for CAXs 4-80 through 7-80 are shown below:

CAX	POST Maint of Equip Cost
4-80	$7,071
5-80	$7,071
6-80	$3,133
7-80	$3,133
8-80	$3,133

CAXs 4-80 and 5-80 were back-to-back FMFPAC CAXs and the total cost was allocated between them. The aviation support equipment 3rd MAW furnished for CAXs 6-80 and 7-80 remained at the Combat Center for CAX 8-80. The total maintenance cost was then allocated equally to the three CAXs.

No breakdown of these POST-CAX Maintenance of Equipment costs could be obtained. Therefore, the type of aviation support equipment accounting for the majority of this cost could not be determined. Neither did the authors obtain any information on the amount of aviation support equipment provided for these CAXs. The authors did speak to the Controller, 3rd MAW, but he could not explain the differences in these costs. One should also remember that the costs shown do not reflect the actual maintenance cost for each CAX. They are average costs. Possibly maintenance costs for CAX 5-80 were unusually high, $11,000 for example, due to some unexpected event that normally does not occur; and the cost for CAX 4-80 was only $3,142, very close to the average costs shown for CAXs 6-80 through 7-80. However, this cannot be determined when back-to-back CAXs are conducted. With this lack of information the author's best estimate for 3rd MAW's

POST-CAX Maintenance cost is simply an average of the amounts shown for CAXs 4-80 through 8-80 which amounts to $4,708. Fortunately, this cost component has little impact on the total cost of a CAX because it is a relatively small amount of money when compared to the cost components which account for the majority of CAX cost such as Ammunition, Consumables, Aircraft Fuel and Maintenance, and DURING - CAX and EAP Maintenance of Equipment costs. Therefore, if 3rd MAW's estimated standard POST-CAX Maintenance of Equipment cost is somewhat inaccurate it should have little effect on the accuracy of the total standard cost of a CAX.

5. Standard Maintenance Cost for 3rd TK BN

Third Tank Battalion incurs POST-CAX Maintenance of Equipment cost for the tanks and amphibious vehicles that it furnishes for each CAX. The reported costs for CAXs 4-80 through 7-80 are as follows:

CAX	POST Maintenance Cost
4-80	$ 580
5-80	$ 580
6-80	$ 374
7-80	$4,235

The costs for CAXs 4-80 through 6-80 do not vary significantly. However, the cost for CAX 7-80 is extremely high in comparison to the cost of the other three CAXs. The Commanding Officer, Third Tank Battalion, verified that this cost is correct because an unusually high number of air cleaners, air cleaner boxes, and seals for air cleaner boxes had to be replaced in

this CAX due to misuse of the vehicles. Because of this the cost for CAX 7-80 is not used in estimating the standard POST Maintenance of Equipment cost for 3rd Tk BN.

Third Tank Battalion maintains "Operations Work Sheets" for each CAX that is conducted. Among other things, these work sheets indicate the number of miles driven by the tanks and amphibious vehicles in the CAX, and the number of these vehicles that was furnished. This data is shown below for CAXs 4-80 through 6-80:

CAX	Total #Vehicles	Total Mileage	Miles/ Vehicle
4-80 & 5-80	47	7,933	169
6-80	24	2,841	118
7-80	33	3,715	113

The average miles per vehicle for all four CAXs calculates to 133 miles. The above data may be used to calculate maintenance cost per mile:

CAX	POST Maint Cost	Total Mileage	Cost/Mile
4-80 & 5-80	$1,160	7,933	$.146
6-80	$ 374	2,841	$.132

Cost data for CAX 7-80 are not calculated for reasons explained earlier. The average maintenance of equipment cost per mile calculates to $.139 per mile. If 133 miles and $.139 are used as the standard number of miles to be driven per vehicle and the standard maintenance cost per mile, the standard Maintenance of Equipment cost for 3rd TK BN may be estimated. From

Appendix A-4 one can see that the standard number of tanks is 17 and the standard number of amphibious vehicles (LVTC-7, LVTP-7, LVTR-7) is 13, for a total of 30 vehicles. The standard Maintenance of Equipment cost may now be estimated:

#Vehicles	Std Miles/ Vehicle	Std Maint Cost/Mile	Std Maint Cost
30	133	$.139	$555

Once again, the numbers shown as the standard miles per vehicle and standard maintenance cost per mile can be made more reliable as data for future CAXs becomes available.

6. Standard Maintenance Cost for 1/4

First Battalion, Fourth Marines often provides troops to act as an aggressor force. When 1/4 does this it also will provide the motor transport assets to support them. The Maintenance of Equipment cost incurred by 1/4 is primarily the maintenance provided to these motor transport assets. The maintenance cost reported by 1/4 for CAXs 4-80 through 7-80 is shown below:

CAX	POST Maint Cost
4-80	0
5-80	$427
6-80	$3,972
7-80	$1,490

This is the only data available to the authors concerning 1/4's POST-CAX Maintenance of Equipment cost. Therefore, the authors have simply taken the average of these costs in estimating the standard POST Maintenance of Equipment costs to be incurred by

1/4, which calculates to $1,472. Once again, this cost accounts for so very little of the total cost of the CAX that its inaccuracy will have very little impact on the accuracy of the total standard CAX cost that is estimated.

7. Standard Maintenance Cost for 4/11

Fourth Battalion, Eleventh Marines provides 155MM howitzers, and sometimes 175MM Guns, to simulate naval gunfire in CAXs. The POST-CAX Maintenance of Equipment cost incurred by 4/11 is the cost of maintenance provided to these weapons. The adjusted cost reports for CAXs 4-80 through 7-80 (EXHIBITS 9-2A, 9-4A, 9-5A, and 9-6A) show the following POST Maintenance of Equipment Costs for 4/11:

CAX	POST Maintenance Cost
4-80	150
5-80	0
6-80	870
7-80	830

Once again this is the only data available to the authors on 4/11's POST-CAX Maintenance of Equipment Cost. Therefore, the authors have simply taken the average of 1/4's maintenance cost for CAXs 4-80 through 7-80 to be used as the Standard POST-CAX Maintenance of Equipment cost for 4/11. The average cost calculates to $463. Once again, this cost accounts for so very little of the total cost of a CAX that its inaccuracy will have very little impact on the accuracy of the total standard CAX cost that is estimated.

8. <u>Standard Maintenance Cost for CSC</u>

Communications Support Company provides communications equipment to the TEECG, and the cost incurred by CSC is the cost of maintenance provided to this equipment. Reported CSC POST-CAX Maintenance of Equipment cost for CAXs 4-80 through 7-80 are shown below:

CAX	POST Maintenance Cost
4-80	$957
5-80	$802
6-80	$870
7-80	$830

This is the only data available to the authors on CSC's Maintenance of Equipment costs. Therefore, the authors have simply taken the average of these costs to be used as the standard POST-CAX Maintenance of Equipment cost for CSC, which calculates to $865. Once again, this cost accounts for so very little of the total cost of a CAX that its inaccuracy will have very little impact on the accuracy of the total standard CAX cost that is estimated.

9. <u>Standard Maintenance Cost for the ACE</u>

Because the method of estimating aircraft maintenance cost is similar to that used to estimate aircraft fuel cost, the estimated standard cost for both aircraft maintenance and fuel is explained in a separate section.

E. STANDARD REPLENISHMENT/REPLACEMENT COSTS

Those units which incur replen/repl costs are the GCE, LSE, 3rd MAW, 3rd TK BN, 1/4, 4/11, CSC, and the EAP.

1. Standard REPLEN/REPL Cost for the GCE

The GCE reported REPLEN/REPL costs of $4,803 and $4,165 for CAXs 4-80 and 5-80, respectively. CAXs 6-80 and 7-80 were FMFLANT CAXs and total FMFLANT REPLEN/REPL costs were reported for these two CAXs. Therefore, the amount that should be attributed to the GCE and 2nd MAW is unknown. Replenishment/Replacement costs probably vary with the number of troops sent to participate in a CAX simply because the amount of T/E items brought to the CAX should increase as the number of personnel participating increases. However, the authors obtained no data on the number of personnel that participated in previous CAXs. Therefore, the authors have simply taken the average of the GCE's Replen/Repl costs in CAXs 4-80 and 5-80 in estimating a standard Replen/Repl cost. This calculates to $4,484 and is probably fairly accurate for FMFPAC CAXs. Since the actual Replen/Repl cost for CAXs 6-80 and 7-80 are unknown, this figure cannot be compared to GCE Replen/Repl costs for FMFLANT CAXs.

2. Standard Replen/Repl Cost for the LSE

Although replen/repl costs are a legitimate cost of the LSE, normally it does not incur this cost. As can be seen from the cost reports shown in Chapter IX, the LSE incurred

no Replen/Repl costs in CAXs 4-80 through 7-80. Therefore, the authors have estimated standard Replen/Repl costs for the LSE to be zero.

3. Standard Replen/Repl Cost for 2nd MAW

As explained earlier actual replen/repl costs for 2nd MAW are unknown. However, if one assumes that replen/repl cost for FMFLANT GCE's are approximately the same as for FMFPAC GCE's, the replen/repl cost for 2nd MAW can be estimated by subtracting the estimated standard GCE Replen/Repl cost from the total Replen/Repl costs reported by FMFLANT in CAXs 6-80 and 7-80. Total Replen/Repl cost for CAXs 6-80 and 7-80 was $10,813 and $17,800 respectively. Deducting $4,484 from these figures leaves estimated replen/repl costs for 2nd MAW in the amounts of $6,329 and $13,316 for CAXs 6-80 and 7-80 respectively. With no other information available the authors have simply taken the average of these two figures as the estimated standard cost of replen/repl for 2nd MAW, which calculates to $9,823. The authors realize the weakness of this estimate based on the stated assumption. However, with no other information available, it is the best estimate that could be given.

4. Standard Replen/Repl Cost for 3rd MAW

Third Marine Aircraft Wing reported Replen/Repl cost for CAXs 4-80 through 7-80 in the following amounts:

CAX	Replen/Repl Cost
4-80	$27,790
5-80	$27,790
6-80	$ 8,247
7-80	$ 8,247

None of these costs represent the actual replen/repl costs incurred for the particular CAX in which they were reported. They are average costs. CAXs 4-80 and 5-80 were FMFPAC CAXs in which the entire ACE was furnished by 3rd MAW. One would expect replen/repl costs to be higher for these CAXs than CAXs 6-80 and 7-80 in which 3rd MAW furnished only part of the ACE. However, the $27,790 reported for CAXs 4-80 and 5-80 is too high. The controller, 3rd MAW, indicated that unused tents were taken out of stock for these CAXs. When they were opened many of them were unserviceable due to the fact they had been stored for so long. These tents, which according to the controller cost $1,000 per tent, were reported as replen/repl costs for CAXs 4-80 and 5-80. These tents should not have been reported as a cost of the CAX because they were not rendered unserviceable as a result of the CAX. The authors could not obtain the number of tents for which this was done so the amount by which the reported costs should be reduced is unknown. However, the controller, 3rd MAW, stated that replen/repl costs for FMFPAC CAXs are normally over $20,000.

The authors could not obtain the breakdown of 3rd MAW's Replen/Repl costs showing what T/E items had to be replaced. This, and the fact that actual replen/repl costs that

should have been reported for CAXs 4-80 and 5-80 are unknown, makes the development of an accurate cost estimating relationship for 3rd MAW's Replen/Repl costs impossible with such little information. Therefore, based on the fact that the Controller,3rd MAW stated that 3rd MAW's Replen/Repl costs for FMFPAC CAXs are normally over $20,000, and the fact that the $27,790 reported for CAXs 4-80 and 5-80 is too high, the authors have assigned $24,000 as the estimated standard Replen/Repl cost for 3rd MAW in FMFPAC CAXs. Because the $8,247 reported as 3rd MAW's Replen/Repl cost for CAXs 6-80 and 7-80 is the average replen/repl costs for three FMFLANT CAXs (CAXs 6-80, 7-80, and 8-80), the authors have established this amount as the standard 3rd MAW Replen/Repl cost for FMFLANT CAXs.

These estimates for 3rd MAW's Replen/Repl cost are the weakest link of the author's estimated standard CAX cost. Other components suffer from this same lack of information; however, they account for an extremely small portion of total CAX cost so that their possible inaccuracy has very little impact on the accuracy of the total standard CAX cost that is estimated. This is not the case for 3rd MAW's Replen/Repl cost. However, the authors have made their best estimate with the little information that is available.

5. Standard Replen/Repl Cost for Third Tank Battalion

Third Tank Battalion reported the following Replen/Repl costs for CAXs 4-80 through 7-80:

CAX	Replen/Repl Cost
4-80	$350
5-80	$350
6-80	$344
7-80	$810

The cost shown for CAX 7-80 is unusually high for the same reasons 3rd TK BN's Maintenance of Equipment cost for that CAX were unusually high. An unusual amount of damage to 3rd TK BN's vehicles was incurred in CAX 7-80 which caused increased maintenance and replen/repl costs to be incurred. Therefore, cost data for CAX 7-80 is not used in estimating standard replen/repl cost for 3rd TK BN.

The authors have again related these costs to the number of miles driven by the tanks and amphibious vehicles based on the assumption that the amount of T/E items that are lost or destroyed in a CAX varies with the amount the tanks and amphibious vehicles are used in that same CAX. The cost per mile for 3rd TK BN's Replen/Repl cost is shown for CAXs 4-80 through 6-80:

CAX	Replen/ Repl/Cost	Total Miles	Cost/ Mile
4-80 & 5-80	$700	7,933	$.12
6-80	$344	2,841	$.09

The cost/mile for CAXs 4-80 and 5-80 is higher than the cost/ mile for CAX 6-80 because the cost/mile for CAX 6-80 does not include the maintenance cost of the second CAX conducted back-to-back with it. The average cost calculates to $.015 per mile. The authors have used this figure as the standard

Replen/Repl cost per mile for 3rd TK BN. Using the standard number of miles to be driven per tank or amphibious vehicle that was calculated earlier when discussing 3rd TK BN Standard Maintenance of Equipment Cost, 3rd Tk Bn Standard Replen/Repl costs may be estimated:

#Veh	Std Miles/Veh	Replen/Repl Cost/Mile	Std Replen/ Repl Cost
30	133	$.105	$419

A more reliable cost per mile can be calculated as information on more CAXs becomes available.

6. Standard Replen/Repl Cost for First Battalion, Fourth Marines

First Battalion, Fourth Marines incurred the following replen/repl costs for CAXs 4-80 through 7-80:

CAX	Replen/Repl Cost
4-80	$1,242
5-80	0
6-80	$2,890
7-80	$ 990

This is the only data the authors obtained pertaining to 1/4's Replen/Repl costs. According to the Battalion Commander, normally 1/4 will incur a cost for replen/repl depending on the number of personnel and equipment he is tasked to provide. Not counting CAX 5-80, the authors have taken the average of the costs shown above to be the estimated standard Replen/Repl cost for 1/4, which calculates to $1,707. If this figure is somewhat inaccurate it should have little impact on the accuracy

of the total standard CAX cost that is estimated because it accounts for a very small portion of total CAX cost.

7. Standard Replen/Repl Cost for Fourth Battalion, Eleventh Marines

From the adjusted cost reports shown in Chapter IX one can see that the adjusted replen/repl costs for 4/11 in CAXs 4-80 through 7-80 are as follows:

CAX	Replen/Repl Cost
4-80	$609
5-80	0
6-80	$ 60
7-80	0

This is the only information available to the authors pertaining to 4/11's Replen/Repl cost. Based on the above data $609 is considered to be an unusually high cost. Because this cost is small enough to almost be considered insignificant, the authors have simply assigned a cost of $100 as the standard Replen/Repl cost for 4/11.

8. Standard Replen/Repl Cost for Communications Support Company

From the adjusted cost reports shown in Chapter IX one can see that the adjusted replen/repl cost for CSC in CAXs 4-80 through 7-80 are as follows:

CAX	Replen/Repl Cost
4-80	0
5-80	0
6-80	$ 60
7-80	$180

As can be seen CSC sometimes incurs no replen/repl costs. This is the only information available to the authors pertaining to CSC's Replen/Repl costs. Because this cost is of such an insignificant amount the authors have simply taken the average of the cost reported for CAXs 6-80 and 7-80 to be the estimated standard Replen/Repl cost for CSC, which calculates to $120.

9. Standard Replen/Repl Cost for the EAP

Although replen/repl costs are valid POST - CAX costs of the EAP, none were reported in CAXs 4-80 through 7-80. As the authors explained in Chapter IX, these costs have probably been included in the costs that have been reported for EAP Maintenance of Equipment. Until these costs are separately reported, or a breakdown of EAP's cost for each CAX is provided, no standard Replen/Repl cost may be developed for the EAP.

F. STANDARD MEDICAL/DENTAL COST

The LSE incurs a DURING - CAX cost for Medical and Dental services it provides to personnel participating in the CAX. This cost is normally only a very small amount. The Med/Den costs for CAXs 4-80 through 7-80 are shown below:

CAX	Med/Den Cost
4-80	$100
5-80	$153
6-80	$135
7-80	$153

The authors have simply taken the average of these figures to be the estimated standard Med/Den cost, which calculates to $135.

G. STANDARD RANGE REPAIR COSTS

Range Support Company incurs the cost of repairing the CAX training range at the conclusion of each CAX. EXHIBIT 9-7 shows the Range Maintenance Officer's calculations of the average cost to repair the CAX training range, which totals to $943. The authors have used this cost as the standard cost for Range Repair.

H. STANDARD CONSUMABLES COST

The LSE incurs the cost of consumable supplies that are used during the CAX. Four types of consumables supply items have accounted for an average of 78 percent of consumables cost in previous CAXs. These four supply items are radio batteries, communications wire, fuel, and lube oil. Standard amounts for each of these items have been developed and the cost for these standard amounts may now be estimated.

1. Standard Cost for Radio Batteries

The standard amount of radio batteries estimated to be needed for a CAX is shown in Appendix A-10. The standard cost for these batteries may be calculated by multiplying the standard number by the prices listed in Appendix A-6. The standard cost for these batteries is calculated below:

NSN	Type	Price	Std #	Std Cost
6135001201020	BA30	$ 3.17	110	$ 349
6135001255256	BA414	$11.88	192	$2,281
6135004647584	BA3553	$23.73	53	$1,258
6135009268322	BA4386	$ 8.44	437	$3,688
		TOTAL Std Batt Cost		$7,576

2. <u>Standard Cost for Communication Wire</u>

The standard amount of communications wire estimated to be needed for a CAX is shown in Appendix A-11. Using the price shown for this wire in Appendix A-6, the standard cost for communications wire is calculated below:

NSN	Type	Price	Std Qty	Std Cost
6145001607795	Phone Cable W/Outer Case	$45.18	45	$2,033
6145002438466	Phone Cable W-O/Outer Case	$61.57	44	$2,709
	TOTAL Std Comm Wire Cost			$4,742

3. <u>Standard Cost for Fuel</u>

The standard amount of gasoline and diesel estimated to be needed for a CAX is shown in Appendix A-9. Using the price shown in Appendix A-6 for these items, the standard cost for fuel is calculated below:

NSN	Type	Price	Std Qty	Std Cost
9130002646281	Gas	$1.26	12,784	$16,108
9140002865294	Diesel	$1.29	38,168	$49,237
	TOTAL Std Fuel Cost			$65,345

4. Standard Cost for Lube Oil

The standard amount of lube oil estimated to be needed for a CAX is shown in Appendix A-12. Using the price shown for these items in Appendix A-6, the standard cost for lube oil is calculated below:

NSN	Type	Price	Std Qty	Std Cost
9150001889867	OE-50	$145.23	8	$1,162
9150001896724	OE-30	$153.73	23	$3,536
9150001912772	Grade 10	$153.73	10	$1,537
91500103555394	Gear Univ Oil	$180.02	4	$ 720
		TOTAL Std Lube Oil Cost		$6,955

5. Total Standard Cost of Consumables

Appendix A-8 shows that radio batteries, communications wire, fuel, and lube oil have accounted for an average of 78 percent of total consumables. Therefore, the estimated standard cost of these items may be summed and used to calculate the total standard consumables cost for a CAX.

The summed standard cost of the above stated items is $84,618. The total estimated standard consumables cost for a CAX is calculated below:

$$.78x = \$84,618$$

Solving this equation for x one gets an answer of x = $108,485, which is the total estimated standard cost of consumables for a CAX.

I. STANDARD AMMUNITION COST

The GCE incurs the cost of ammunition expended by ground forces in every CAX. The cost of ammunition expended by the ACE is incurred by 2nd MAW or 3rd MAW depending on whether the CAX is a FMFLANT CAX or a FMFPAC CAX. The reason air ammunition is not shown as a DURING - CAX cost of the ACE is because all costs incurred by the ACE are paid for with O&M,N Funds. Because the cost of ammunition is paid for with O&M,MC funds, it is charged as an expense of the Marine Aircraft Wing that provides the ACE. Even though 3rd MAW provides part of the ACE for FMFLANT CAXs, the ammunition that is expended is charged in total to 2nd MAW.

1. Standard Ground Ammunition Cost

Appendix A-15 shows the types of weapons which have accounted for an average of 90 percent of the total cost of ground ammunition expended in past CAXs. Appendix A-16 shows the standard issue of the ammunition fired by these weapons, and Appendix A-27 shows the estimated cost for this standard issue which totals to $752,870. The total estimated standard cost may be calculated with the following equation:

$$.90x = \$752,870$$

Solving this equation for x, one gets an answer of x = $836,522 as the total estimated standard cost of ground ammunition. If one compares this cost to the total ammunition cost reported for past CAXs shown in Appendix A-14 he may conclude that the estimated standard cost is too high because it is higher than

the ammunition cost of all of the previous CAXs that are shown. However, 155MM howitzer ammunition was not used in six of the nine CAXs shown in Appendix A-14. The authors have included the 155MM howitzer in their standard package for combat equipment because the TEECG indicates that these weapons will be used in future CAXs. If the standard cost for 155MM howitzer ammunition is subtracted from the total standard amount the resulting figure is $741,095 which is within the cost range of previous CAXs. Therefore, this standard is good enough for forecasting future ammunition cost. However, it will not satisfactorily serve the purpose of cost control if an objective of minimizing ammunition cost is implemented. To reduce cost one must reduce the quantity of the more expensive ammunitions that are expended. The most expensive rounds are those fired by the following weapons:

155MM Howitzer
105MM Howitzer
M60 A1 Tank
81MM Mortar

The reduction of rounds fired by any of these weapons should significantly reduce the total cost of ground ammunition. The number of rounds fired by other weapons could be significantly more than standard, with the total ammunition cost still being signficantly less, if the number of rounds fired by the above listed weapons were limited. Therefore, attention must be drawn to these weapons when trying to reduce ammunition cost.

2. <u>Standard Air Ammunition Cost</u>

Appendix A-20 shows the type of air ammunition that have accounted for an average of 84 percent of total air ammunition cost in previous CAXs. Appendix A-23 shows the standard issue of these ammunitions, and Appendix A-28 shows the standard air ammunition cost that has been calculated for this standard issue. As can be seen the standard cost varies depending on whether A-4 aircraft are used, F-4 aircraft are used, or AV-8 aircraft are used. The cost for each is shown below:

	Cost
When A-4s are used	\$209,526
When AV-8s are used	\$225,203
When F-4s are used	\$230,719

The total estimated standard air ammunition costs may be calculated as follows:

$$.84x = \$209,526$$
$$.84x = \$225,203$$
$$.84x = \$230,719$$

Solving these equations for x, one gets values of x = \$249,536, x = \$268,099, and x = \$274,665. These values are the respective total estimated standard air ammunition costs for a CAX when A-4s are used, when AV-8s are used, and when F-4s are used.

J. STANDARD COST FOR AIRCRAFT FUEL AND MAINTENANCE

Standard costs for aircraft fuel and maintenance proposed in this section were developed using ratios derived from data

presented in the Marine Corps Cost Factors Manual to allocate cost of fuel and maintenance to the different aircraft types used in the CATP. MCAGCC Order 3500.11 recommends the use of A-4s, AV-8s, or F-4s with the A-6 as the fixed wing complement of the ACE [13:ENCL(3) p.3]. Standard costs presented in this section are separated by these three aircraft categories.

1. Standard Aircraft Fuel Cost

Appendix A-30 shows fuel costs per flight hour (CPFH) for the various aircraft types involved in the CATP. These CPFHs by aircraft type were determined by dividing the total annual fuel cost given in the Cost Factors Manual by the annual flying hours given in the same.

Since MCAGCC receives aggregated cost data, individual CPFHs for fuel by aircraft type is not recorded. To establish these CPFHs the authors selected an aircraft type that was to be used in every CAX and could be used as a base for establishing ratios for percentage of total fuel cost assignment to other aircraft types used in the ACE. The A-6 was selected for the following reasons:

1. It is used in every CAX.

2. It has a consistent hours/sortie rate.

3. It has the highest CPFH for fuel of any aircraft that is used in every CAX.

4. Its mission is consistent for all sorties.

These ratios were derived by dividing the CPFH of the aircraft in question by the CPFH of the A-6. Since the CPFHs taken from the Cost Factors Manual were considered stabilized, the authors assumed that these ratios would not change significantly during a CAX. These derived ratios (percentages) were then used to form a model to determine CPFHs for all aircraft types utilized in the CAXs.

Appendix A-31 lists overall average fuel CPFHs by various aircraft type with its corresponding percentage of A-6 fuel CPFH. These data apply only to the CPFH during a CAX, not to any other exercise that may be conducted in the Marine Corps. The fuel CPFH for the A-6 during a designated CAX was established using the following model, and solving it for x.

$$\sum_{1}^{N} YZX = \text{Total CAX Aircraft Fuel Cost}$$

where,

N = Number of aircraft by type
Y = Cost ratio for each aircraft type
X = Cost per flight hour for the A-6,

and,

Z = Flight hours by aircraft type.

Appendices A-34 through A-37 shows calculations of A-6 fuel cost for CAXs 4-80 through 7-80.

The calculated A-6 fuel CPFH was then used to establish the fuel CPFH for all other types of aircraft used in a particular CAX by multiplying the CPFH for the A-6 by the cost

ratio for each aircraft type. Fuel CPFHs for each aircraft type were consolidated to determine an average aircraft fuel CPFH for the CATP. These consolidated CPHFs are shown in Appendix A-32. Notice should be given to the considerable variance between these CPFHs and those presented in Appendix A-30. This variance is due primarily to the increase in the cost of jet fuel. The fuel costs shown in the Cost Factors Manual, published 1 January 1980, reflects an average CPFH for calendar year 1979.

These derived fuel aircraft type CPFHs were multiplied by the standard flight hours (shown in Appendix A-25) to yield standard CAX fuel cost per aircraft. These costs were then summed to yield a total estimated fuel cost for the standard CAX. These costs are presented in Appendix A-32.

2. <u>Standard Aircraft Maintenance Cost</u>

Appendix A-31 shows maintenance CPFH for the various aircraft types involved in the CATP. The CPFHs were determined in the same manner and for the same reasons as were fuel CPFHs. These calculations are shown in Appendices A-38 and A-39.

Appendix A-31 lists overall maintenance CPFHs by involved aircraft type along with its corresponding percentage of A-6 maintenance CPFH. Notice should be given to the significant variance between the Marine Corps wide maintenance CPFHs presented in Appendix A-31. The maintenance CPFHs for CAXs 4-80 and 5-80 were found to be significantly higher for all aircraft types than those reported for CAXs 6-80 and 7-80.

Upon further investigation the authors learned that FMFPAC is reporting actual maintenance cost, adjusted for cost increases and that FMFLANT is reporting actual maintenance cost. The result is that FMFPAC's reported maintenance cost is generally twice as high as FMFLANT's.

Based on the fact that FMFPAC reports estimated costs, rather than actual cost, the authors did not use FMFPAC's cost data to estimate maintenance CPFHs. Nor did the authors use the estimated maintenance CPFHs from the Cost Factors Manual because these costs are an average of the previous years cost involving types of flying not encountered in the CAX scenario.

Since the only actual maintenance costs were reported by FMFLANT, the authors have used FMFLANT's data to calculate the standard maintenance CPFH for each aircraft type. These figures are presented in Appendix A-31. Estimated standard aircraft maintenance cost by aircraft type and total estimated standard maintenance cost are presented in Appendix A-33.

K. STANDARD COMMON-CAX COSTS

The EAP and the TEECG both incur COMMON-CAX costs that cannot be attributed to any particular CAX, but which are nonetheless costs that must be attributed to the CATP. These costs are the day-to-day operating costs for these units to function, and includes any cost they incur which cannot be directly traced to a CAX. This cost could be estimated by the annual budget in dollars for these two units and subtracting from it

the estimated costs that can be attributed directly to the individual CAXs. For the EAP this would entail subtracting the estimated standard cost for maintenance of equipment and replen/repl for each CAX. For the TEECG this would entail subtracting the estimated standard TAD costs incurred as a result of each CAX. The remaining portion of the budget can then be allocated equally to each CAX as COMMON-CAX costs. The authors do not know the budget for the EAP nor the TEECG. However, the Controller, MCAGCC, should be able to do this very easily.

L. COMPARISON OF STANDARD CAX COST TO ADJUSTED COST OF PREVIOUS CAX.

EXHIBITS 10-4 through 10-9 show the standard CAX cost for FMFLANT and FMFPAC CAXs when A-4 aircraft are used, when AV-8 aircraft are used, and when F-4 aircraft are used. EXHIBIT 10-10 shows a comparison of these costs to the total adjusted CAX cost for CAXs 4-80 through 7-80 that were shown in Chapter IX. As can be seen the estimated standard cost is higher than the adjusted cost for CAXs 4-80 through 7-80.

When comparing the estimated standard CAX cost to the adjusted costs for CAXs 4-80 through 7-80, one must remember that the types and amounts of equipment used in these CAXs are unknown. If a lesser amount of equipment was used in these CAXs than the standard package upon which the estimated standard cost is based, then one would expect the standard cost

UNIT	PRE	DURING	POST	COMMON
GCE	TAD TOT TOP 235,270	Ammo 836,522	Replen/Repl 4,494 Maint of Equip TOT TOP 264,072	
ACE(O&M,N) FMFLANT	TAD 546	A/C Fuel 133,134	Maint of Equip 24,724	
FMFPAC	TAD	A/C Fuel 93,110	Maint of Equip 53,725	
LSE	TOT 702 TOP 748	Med/Den 135 Maint of Equip 17,833 Consumables 108,485	Maint of Equip 2,140 Replen/Repl TOT 702 TOP 748	
2nd MAW	TAD 3,591 TOT TOP 62,540	Ammo 249,536	TOT TOP 66,018 Replen/Repl 9,823	
3rd MAW	TAD 1,733 TOT TOP	Ammo	TOT. TOP Replen/Repl 8,247 Maint of Equip 4,708	
CAC 3rd TK BN	NONE	NONE	Maint of Equip 555 Replen/Repl 419	
1/4	NONE	NONE	Maint of Equip 1,472 Replen/Repl 1,707	
4/11	NONE	NONE	Maint of Equip 463 Replen/Repl 109	
CSC	NONE	NONE	Maint of Equip 865 Replen/Repl 120	
MCAGCC EAP	NONE	NONE	Maint of Equip 13,375 Replen/Repl	Ops Cost
RSC	NONE	NONE	Range Repair 943	
TEECG	TAD 1,400			Ops Cost

Total CAX Cost $ 2,204,695

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days		26	171	214	14

EXHIBIT 10-4. Standard FMFLANT CAX Cost When A-4s are used by the ACE.

UNIT	PRE	DURING	POST	COMMON
GCE	TAD TOT TOP 235,270	Ammo 836,522	Replen/Repl 4,494 Maint of Equip TOT TOP 264,072	
ACE(O&M,N) FMFLANT	TAD 546	A/C Fuel 147,433	Maint of Equip 37,405	
FMFPAC	TAD	A/C Fuel 93,110	Maint of Equip 53,725	
LSE	TOT 702 TOP 748	Med/Den 135 Maint of Equip 17,333 Consumables 108,485	Maint of Equip 2,140 Replen/Repl TOT 702 TOP 748	
2nd MAW	TAD 3,591 TOT TOP 62,540	Ammo 268,099	TOT TOP 66,013 Replen/Repl 9,823	
3rd MAW	TAD 1,733 TOT TOP	Ammo	TOT TOP Replen/Repl 8,247 Maint of Equip 4,703	
CAC 3rd TK BN	NONE	NONE	Maint of Equip 555 Replen/Repl 419	
1/4	NONE	NONE	Maint of Equip 472 Replen/Repl 1,707	
4/11	NONE	NONE	Maint of Equip 463 Replen/Repl 100	
CSC	NONE	NONE	Maint of Equip 865 Replen/Repl 120	
MCAGCC EAP	NONE	NONE	Maint of Equip 13,375 Replen/Repl	Ops Cost
RSC	NONE	NONE	Range Repair 943	
TEECG	TAD 1,400			Ops Cost

Total CAX Cost $ 2,250,238 .

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days		26	171	214	14

EXHIBIT 10-5. Standard FMFLANT CAX Cost When AV-8s are used by the ACE.

UNIT	PRE	DURING	POST	COMMON
GCE	TAD	Ammo 836,522	Replen/Repl 4,494	
	TOT		Maint of Equip	
	TOP 235,270		TOT	
			TOP 264,072	
ACE(O&M,N) FMFLANT	TAD 672	A/C Fuel 205,623	Maint of Equip 32,305	
FMFPAC	TAD	A/C Fuel 93,110	Maint of Equip 53,725	
LSE	TOT 702	Med/Den 135	Maint of Equip 2,140	
	TOP 748	Maint of Equip 17,933	Replen/Repl	
		Consumables 108,495	TOT 702	
			TOP 748	
2nd MAW	TAD 3,591	Ammo 274,665	TOT	
	TOT		TOP 66,018	
	TOP 62,540		Replen/Repl 9,323	
3rd MAW	TAD 1,749	Ammo	TOT	
	TOT		TOP	
	TOP		Replen/Repl 8,247	
			Maint of Equip 4,708	
CAC 3rd TK BN	NONE	NONE	Maint of Equip 555	
			Replen/Repl 419	
1/4	NONE	NONE	Maint of Equip 1,472	
			Replen/Repl 1,707	
4/11	NONE	NONE	Maint of Equip 463	
			Replen/Repl 100	
CSC	NONE	NONE	Maint of Equip 965	
			Replen/Repl 120	
MCAGCC EAP	NONE	NONE	Maint of Equip 13,375	Ops Cost
			Replen/Repl	
RSC	NONE	NONE	Range Repair 943	
TEECG	TAD 1,400			Ops Cost

Total CAX Cost $ 2,310,536

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days		32	171	214	14

EXHIBIT 10-6. Standard FMFLANT CAX Cost When F-4s are used by the ACE.

UNIT	PRE	DURING	POST	COMMON
GCE	TAD TOT TOP 5,096	Ammo 836,522	Replen/Repl 4,484 Maint of Equip TOT TOP	
ACE(O&M,N) FMFLANT	TAD	A/C Fuel	Maint of Equip	
FMFPAC	TAD	A/C Fuel 226,224	Maint of Equip 73,449	
LSE	TOT 702 TOP 748	Med/Den 135 Maint of Equip 17,633 Consumables 108,485	Maint of Equip 2,140 Replen/Repl TOT 702 TOP 748	
2nd MAW	TAD TOT TOP	Ammo	TOT TOP Replen/Repl	
3rd MAW	TAD 1,250 TOT TOP 1,178	Ammo 249,536	TOT TOP 1,178 Replen/Repl 24,000 Maint of Equip 4,708	
CAC 3rd TK BN	NONE	NONE	Maint of Equip 555 Replen/Repl 419	
1/4	NONE	NONE	Maint of Equip 1,472 Replen/Repl 1,707	
4/11	NONE	NONE	Maint of Equip 463 Replen/Repl 100	
CSC	NONE	NONE	Maint of Equip 365 Replen/Repl 120	
MCAGCC EAP	NONE	NONE	Maint of Equip 13,375 Replen/Repl	Ops Cost
RSC	NONE	NONE	Range Repair 943	
TEECG	TAD 250			Ops Cost

Total CAX Cost $ 1,584,387

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days				25	5

EXHIBIT 10-7. Standard FMFPAC CAX Cost When A-4s are used by the ACE.

UNIT	PRE	DURING	POST	COMMON
GCE	TAD ____ TOT ____ TOP 5,096	Ammo 836,522	Replen/Repl 4,494 Maint of Equip ____ TOT ____ TOP ____	
ACE(O&M,N) FMFLANT	TAD ____	A/C Fuel ____	Maint of Equip ____	
FMFPAC	TAD ____	A/C Fuel 240,543	Maint of Equip 91,130	
LSE	TOT 702 TOP 748	Med/Den 135 Maint of Equip 17,833 Consumables 108,485	Maint of Equip 2,140 Replen/Repl ____ TOT 702 TOP 748	
2nd MAW	TAD ____ TOT ____ TOP ____	Ammo ____	TOT ____ TOP ____ Replen/Repl ____	
3rd MAW	TAD 1,250 TOT ____ TOP 1,178	Ammo 268,099	TOT ____ TOP 1,178 Replen/Repl 24,000 Maint of Equip 4,708	
CAC 3rd TK BN	NONE	NONE	Maint of Equip 555 Replen/Repl 419	
1/4	NONE	NONE	Maint of Equip 1,472 Replen/Repl 1,707	
4/11	NONE	NONE	Maint of Equip 463 Replen/Repl 100	
CSC	NONE	NONE	Maint of Equip 865 Replen/Repl 120	
MCAGCC EAP	NONE	NONE	Maint of Equip 13,375 Replen/Repl ____	Ops Cost
RSC	NONE	NONE	Range Repair 943	
TEECG	TAD 250			Ops Cost

Total CAX Cost $ 1,629,950

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days				25	5

EXHIBIT 10-8. Standard FMFPAC CAX Cost When AV-8s are used by the ACE.

UNIT	PRE		DURING		POST		COMMON
GCE	TAD		Ammo	836,522	Replen/Repl	4,484	
	TOT				Maint of Equip		
	TOP	5,096			TOT		
					TOP		
ACE(O&M,N) FMFLANT	TAD		A/C Fuel		Maint of Equip		
FMFPAC	TAD		A/C Fuel	298,733	Maint of Equip	86,530	
LSE	TOT	702	Med/Den	135	Maint of Equip	2,140	
	TOP	748	Maint of Equip	17,833	Replen/Repl		
			Consumables	108,485	TOT	702	
					TOP	748	
2nd MAW	TAD		Ammo		TOT		
	TOT				TOP		
	TOP				Replen/Repl		
3rd MAW	TAD	1,250	Ammo	274,665	TOT		
	TOT				TOP	1,178	
	TOP	1,178			Replen/Repl	24,000	
					Maint of Equip	4,708	
CAC 3rd TK BN	NONE		NONE		Maint of Equip	555	
					Replen/Repl	419	
1/4	NONE		NONE		Maint of Equip	1,472	
					Replen/Repl	1,707	
4/11	NONE		NONE		Maint of Equip	463	
					Replen/Repl	100	
CSC	NONE		NONE		Maint of Equip	865	
					Replen/Repl	120	
MCAGCC EAP	NONE		NONE		Maint of Equip	13,375	Ops Cost
					Replen/Repl		
RSC	NONE		NONE		Range Repair	943	
TEECG	TAD	250					Ops Cost

Total CAX Cost $ 1,690,106

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days				25	5

EXHIBIT 10-9. Standard FMFPAC CAX Cost When F-4s are used by the ACE.

1. Total FMFLANT Estimated Standard CAX Cost:

		Cost
a.	When A-4s are used	$2,204,695
b.	When AV-8s are used	$2,250,238
c.	When F-4s are used	$2,310,536

2. Total FMFPAC Estimated Standard CAX Cost:

a.	When A-4s are used	$1,584,387
b.	When AV-8s are used	$1,629,950
c.	When F-4s are used	$1,690,106

3. Adjusted CAX Cost for CAXs 4-80 through 7-80:

CAX	COST
4-80 (FMFPAC)	$1,261,874
5-80 (FMFPAC)	$1,244,429
6-80 (FMFLANT)	$2,037,255
7-80 (FMFLANT)	$1,842,817

EXHIBIT 10-10. Comparison of Estimated Standard CAX Cost to Adjusted Cost for CAXs 4-80 through 7-80.

to be higher. There is no way of knowing the accuracy of this estimate without knowing the levels of equipment that was used in previous CAXs. To the authors' knowledge, this is the only study that has ever been presented for any specified level of equipment to be used in a CAX. This standard cost estimate is good for forecasting the cost of a CAX. Again, however, if one wants to reduce total CAX cost, he must devote attention to reducing the amount of the most expensive items that are used. Standards for these items have been created by the authors. They include number of vehicles, amounts of the four most expensive consumable supplies, ammunition, aircraft fuel, and maintenance of equipment. One should concentrate in the factors that drive these costs when reducing cost in the objective.

M. SUMMARY

This chapter has shown how the authors derived the estimated standard cost of the CAX. The following chapter discusses the strengths and weaknesses, not only of this particular chapter, but of the entire analysis.

XI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter summarizes what has been accomplished in this study. Based on the analysis of the existing CATP cost accounting system and the cost reports of past CAXs, conclusions regarding the financial side of the CATP are made. Recommendations for potential improvement of the financial planning and control system for the program are listed.

A. SUMMARY

The primary contribution of this study is that it is the first formalized study of the financial impact of the entire CATP. The study does not focus on only one segment of the CATP, or only one unit that is involved; but looks at the CATP from an overall Marine Corps point of view with the intention of identifying what is in the best interest of the Marine Corps as a whole. Although an in depth analysis of every segment of the CATP was not performed in this study, it should nonetheless serve as a starting point from which the CATP can gain greater overall efficiency.

Specific accomplishments of this study are as follows:

1. Identification of Causes of the Cost Determination Problem.

The controllers of the participating commands have realized that problems exist in identifying not only what a

CAX should cost, but what CAXs in the past actually have cost. However, the causes of this problem have not been apparent. Chapter III identified and discussed five underlying causes of the inability to estimate CAX cost, three of which pertained to the lack of established standards for a CAX, and the other two pertained to the CATP budgeting system. Individuals may differ as to what is the solution to these causes. However, identification of these causes is the key to the development of solutions.

2. Introduction of a Standard Cost System to the CATP for Cost Control.

The way in which standards may be used in controlling, evaluating, and planning the CATP was discussed in Chapter III. A technique by which inefficiencies may be more readily detected and corrected was introduced.

3. Identification of the Weaknesses of the CATP Budgeting System.

In Chapter IV, two requisites were specified as being necessary before a program can be conducted efficiently. Attention was drawn to the fact that the present CATP budgeting system does not meet either of these requisites. Identifying this fact is perhaps the single most important strength of the study because changing the CATP budgeting system is the one area in which a strategic (HQMC level) decision would have to be made.

4. Legitimate CAX Costs Identified and Defined

A continuing problem in the past has been disagreement as to what should or should not be considered a CAX cost. The legitimate CAX costs were identified and defined in Chapter VI.

5. Alternate Cost Report Format Proposed

Coupled with the fact that there has been disagreement as to what costs should be reported, is the fact that one cannot tell from the present cost report what costs actually have been reported. This is due to the fact that the present cost report allows costs to be reported under broad cost categories such as "Ops/Admin" and "Training" which by definition allows loose interpretation of what is to be included as a cost. Therefore, when costs are reported under these categories, one does not know what is being reported as a CAX cost. The controllers that submitted these costs many times did not know themselves what they included. When asked, the controllers would state what they probably included, or perhaps know partially what they included, but seldom could the controllers give a breakdown as to what expenses were incurred that summed to the total amounts reported under these categories. These terms come from the Field Budget Guidance Manual and are used for planning purposes when preparing and submitting budget requests. In this case they are necessary because the commands cannot feasibly state the specific cost component for which

each dollar of the budget will be spent. However, such broad cost categories need not be used when reporting costs under a particular program. As an alternative to the present cost report, the authors have provided one that is more specific in nature allowing only legitimate CAX costs to be reported.

6. Importance of a Standard Equipment Package Stressed

A standard equipment package was recommended in Chapter VIII and the importance of a standard equipment package was explained. Whether or not the quantity presented in this study is adopted is not important. What is important is that a standard equipment package be used because all other costs depend on the level of equipment that is used. Without a standard equipment package the cost of a CAX cannot be accurately estimated.

7. Most Expensive Supply Items Identified

Of the numerous types of consumable supply items that are used in a CAX, four have accounted for an average of 78 percent of total supply cost. These four items were identified in Chapter VIII, and may be used to estimate the standard cost of supplies as was done in Chapter X.

8. Method of Estimating Aircraft Flight Hours Provided

The cost of aircraft fuel and maintenance depends upon the number of hours that each type of aircraft flies. Therefore, in order to estimate the cost of aircraft fuel and maintenance, the number of flight hours that will be flown must

somehow be estimated. A simple method of doing so was provided in Chapter X.

9. Methods of Estimating Maintenance, TAD, TOT, and TOP Costs Provided

Simple methods for estimating these costs were provided in Chapter X. Depending on the level of resources identified to be used in a CAX, these cost estimates will vary. However, the identified methods for estimating these costs should remain valid for any level of resources that is identified.

B. LIMITATIONS OF THE STUDY

The limitations of this study, which pertain primarily to the cost estimates of Chapter X, are as follows:

1. Historical Data Limited

Formal CAX cost reporting began with CAX 4-80. The authors had cost reports for only four CAXs, CAXs 4-80 through 7-80. For the most part, information was available for only these four exercises. Exceptions to this were consumable supply items and ammunitions. This tends to weaken the accuracy of some of the cost estimates provided in Chapter X. However, the method used to estimate them remains valid.

2. Historical Data not Provided

Some of the historical data needed had not been maintained in a reportable format and was simply not available to the authors in a reasonable period of time. Examples are as follows:

a. The types and numbers of each type of vehicle that were actually used in each CAX.

b. The number of the above vehicles that were provided by the EAP.

c. Mileage data by type of vehicle for each CAX.

d. The number of personnel from each unit that participated in each CAX.

e. The number of personnel from each unit that incurred the reported per diem days.

f. The number of personnel transported to and from the Combat Center by commercial bus and C-141 military airlift.

g. The number of commercial bus loads that were necessary to transport the personnel of each unit to the Combat Center.

h. The number of C-141 flights that were necessary to transport personnel to and from the Combat Center.

i. For FMFLANT CAXs, the number of flight hours, by type of aircraft, actually flown during each CAX.

j. For FMFLANT CAXs, the number of sorties, by type of aircraft, actually flown during the CAX.

k. Cost of aircraft fuel, by type of aircraft, that was consumed during the CAX.

l. Cost of aircraft maintenance, by type of aircraft, that was attributed to the CAX.

m. Actual, rather than estimated, aircraft maintenance cost from 3rd MAW.

All these data would have contributed to the accuracy of the cost estimate of a CAX had it been available.

3. Historical Data Contaminated

In some cases the data that was available could not be relied upon. For example, the cost of consumable supplies for past CAXs is the cost of items that were purchased for the CAX, not the cost of items actually used during the CAX. Excess supplies should not be reported as a CAX cost, but they have been. An exception to this is the cost of fuel.

The net effect of these limitations is that the cost estimates presented in Chapter X for the standard CAX are not as accurate as they otherwise might have been. However, the methods used to calculate these cost estimates remain valid.

C. CONCLUSIONS

Based on the analysis mentioned above, conclusions can be reached concerning the budgeting, accounting, and reporting system of the CATP.

1. The actual costs of past CAXs are unknown mainly due to the inadequacy of existing accounting and reporting procedures. The system presently in use does not identify specific cost components, but instead identifies broad cost categories which, by definition, include many costs that should not be

attributed to the CATP. Because of the foregoing condition, confusion exists as to what should be reported under these categories. All valid costs were not collected in the past, i.e. Ammunition and COMMON CAX costs. Invalid costs were included, i.e. excess supplies being charged to the CATP; although they were not actually consumed during the CAX.

2. What a CAX should cost can be estimated using the methods recommended in this study. The best estimate of what a CAX should cost, based on available information, has been presented. This estimate is not as accurate as would be desired because the data were: 1) limited primarily to four CAXs; 2) contaminated, due to the inclusion of costs that should not have been attributed to the CAX; and 3) in some cases, not available in a reportable form.

3. Improvements can be made within the CATP so that the actual cost of CAXs conducted in the future may be better controlled, and may be more accurately estimated. This study analyzed the present accounting and reporting procedures and recommended a revised system for implementation.

D. RECOMMENDATIONS

Based on the analysis presented in this study the following recommendations are offered for adoption by appropriate commands for improvement in the planning and control of the program:

1. That control and budgeting for the CATP Q&M, Marine Corps Cost Components be centralized with MCAGCC (See Chapters IV and V).

2. That the objectives of the CATP be reviewed and recognized by all participating commands.

3. That standard issues of equipment, supplies, and ammunition be created to meet the recognized objectives of the CATP (See Chapter III).

4. That before a given standard level of CAX resources is increased, the issue as to whether or not that given level is meeting the objectives of the CATP be decided (See Chapters III and VIII).

5. That the technique shown in Chapter III explaining how standards may be used to identify possible inefficiencies be implemented for the critical cost items.

6. That excess supplies not be charged as a cost of the CAX (See Chapter III).

7. That ammunition expended for additional target practice at the conclusion of a CAX not be reported as ammunition expended in the CAX (See Chapter III).

8. That the cost report format shown in Appendix A-1, and explained in Chapter VI, be implemented.

9. That the data which Chapter XI specified as being unavailable to the authors be attached to cost reports when they are submitted.

10. That the cost effectiveness of back-to-back CAXs be taken under study, especially from a long-term point of view (See Chapter X).

11. That the severe personnel shortage of the EAP be eliminated or significantly reduced if possible (See Chapter X).

Further research is needed to determine the best way to implement the budgeting and control system recommended in this study; relate the level of resources that should be maintained by the EAP to the number of personnel required to support these resources; and to determine the cost effectiveness of back-to-back CAXs, which is the most pressing problem of the EAP.

APPENDIX A-1

UNIT	PRE	DURING	POST	COMMON
GCE	TAD ______ TOT ______ TOP ______	Ammo ______	Replen/Repl ______ Maint of Equip ______ TOT ______ TOP ______	
ACE(O&M,N)				
FMFLANT	TAD ______	A/C Fuel ______	Maint of Equip ______	
FMFPAC	TAD ______	A/C Fuel ______	Maint of Equip ______	
LSE	TOT ______ TOP ______	Med/Den ______ Maint of Equip ______ Consumables ______	Maint of Equip ______ Replen/Repl ______ TOT ______ TOP ______	
2nd MAW	TAD ______ TOT ______ TOP ______	Ammo ______	TOT ______ TOP ______ Replen/Repl ______	
3rd MAW	TAD ______ TOT ______ TOP ______	Ammo ______	TOT ______ TOP ______ Replen/Repl ______ Maint of Equip ______	
CAC				
3rd TK BN	NONE	NONE	Maint of Equip ______ Replen/Repl ______	
1/4	NONE	NONE	Maint of Equip ______ Replen/Repl ______	
4/11	NONE	NONE	Maint of Equip ______ Replen/Repl ______	
CSC	NONE	NONE	Maint of Equip ______ Replen/Repl ______	
MCAGCC				
EAP	NONE	NONE	Maint of Equip ______ Replen/Repl ______	Ops Cost
RSC	NONE	NONE	Range Repair ______	
TEECG	TAD ______	NONE	NONE	Ops Cost

Total CAX Cost $ ______

	GCE	ACE	2nd MAW	3rd MAW	TEECG
Number of Per Diem Days					

APPENDIX A-2

EQUIPMENT USED IN PAST CAXs

TAM#	Nomenclature	3-79	4-79	2-80	3-80	4-80	6-80	7-80
A0265	Comm Central AN/MRC-87A	4	3	4	4	1	2	2
A0320	Radio Cont Set AN/GRA-6	6	14	6			15	12
A1730	Cont Grp Rad Set AN/GRA-39A	35	36	35			23	28
A1920	Rad Set MRC-109	6	9	9	11	4	6	6
A1930	Rad Set MRC-110	4	2	5	2		2	2
A2020	Rad Set AN/PRC-47	11	9	11			6	6
A2040	Rad Set AN/PRC-75A	4	8	4			7	8
A2050	Rad Set PRC-77	141	88	141			63	81
A2050	Rad Set PRC-25	3		3				
A2183	Rad Term Set AN/MRC 1-35		2	3			2	2
A2480	Manual Phone Switchboard SB-22	7	9	7			4	5
B0060	Bath Unit	2	2	2	2	1		
B0440	3T wheel Mtd Crane	2	2	3	1		2	2
B0630	Trlr Mtd Floodlite Set	4	5	5	10	4	1	2
B0730	Generator 3kw, 60HZ	5	5	2	2	3	2	3

TAM#	Nomenclature	3-79	4-79	2-80	3-80	4-80	6-80	7-80
B0953	Generator 45kw, 60HZ		2	4		1	1	1
B0971	Generator 30kw, 400HZ			6		1	2	2
B1020	Generator 60kw, 60HZ		1		2		2	2
B1650	Refrig Unit 100 cu. ft.	8	8	7	4		2	2
B1660	Refrig Unit 630 cu. ft.	2	3	2	2			
B1690	Prefab Refrig 100 cu. ft.		6		4			
B1700	Prefab Refrig 630 cu. ft.		1		2		3	3
B2462	Full Tracked Tractor (Medium)	2	3		1			
B2463	Full Tracked Tractor w/Multi Purp Buck Case		1	2	2			
B2465	Rubber Tired Tractor	1	1		2			
B2560	Forklift Truck	4	2	2	3			
C4000	A Pack, Field Range			15	15		12	15
C4436	Water Can				245			
C4480	Folding Cot				1730		1425	1445
C4870	Fly Tent				10		4	2
C4880	Food Container			34	30	115	40	40
C4980	Immersion Heater			27	27	20	30	30
C5110	Vacuum Jug			34		40	40	40
C5820	Field Range			30	24		24	24

TAM#	Nomenclature	3-79	4-79	2-80	3-80	4-80	6-80	7-80
C6390	CP Tent				16	6		
C6410	GP Tent				123	90	141	141
C6420	Maint Tent				7	3	10	10
D0110	Dolly Converter	1	1	1	1			
D0260	Semitrailer M127			3			1	1
D0290	Van M13	2	3	2				
D0840	1/4 Ton Cargo Trlr M416	56	36	36	36	28	40	36
D0860	1 1/2 Ton Cargo Trlr M105	10	10	13	10	5	9	7
D0880	Water Trlr M149	13	13	9	11	5	18	18
D0890	1/4 Ton Ambulance Trk M718	1	1	1	2	1	1	1
D1015	1 1/4 Ton Cargo Trk M880	1	9	7	6		6	6
D1020	1 1/4 Ton Cargo Trk w/winch	6	10	4	4	4	7	4
D1030/40	2 1/2 Ton Cargo Trk	14	18	23	32	20	28	26
D1050	5 Ton Cargo Trk	21	21	10		1	0	1
D1070	Dump Trk 5 Ton M51A2	1	3	2		2	1	1
D1100	1/2 Ton Util Platform Trk	4	3	8	2	22	5	11

TAM#	Nomenclature	3-79	4-79	2-80	3-80	4-80	6-80	7-80
D1110	2 1/2 Ton Refueling Trk	5	6	3			2	2
D1120	2 1/2 Ton Water Tank Trk	2	2	3	3		1	1
D1130	5 Ton Tractor Trk	1	2	3	4		1	1
D1155	1/4 Ton GM Equip Trk	8	2	8			8	8
D1156	1/4 Ton GM Carrier Trk	4	1	4			4	4
D1160	1/4 Ton Utility Trk	53	34	43	43	42	40	33
D1210	5 Ton Wrecker Trk	3	3	2	2			
E0640	Light Towed Howitzer 105mm	4	6	6	6	6	6	6
E0795	LVTC-7	2	3	2	2	2	2	2
E0845	LVTP-7	14	14	10	10	10	10	10
E0855	LVTR-7	1	1	1			1	1
E1090	Mortar 81mm	2	8	8			7	6
E1875	Tank M60A1	17	17	5	5		17	17

APPENDIX A-3

STANDARD NONCOMBATANT EQUIPMENT PACKAGE

TAM#	NOMENCLATURE	GCE	ACE	HHQ	TEECG	TOTAL	NOTE
A0265	MRC 87	1	1		1	3	
A1900	MRC 83	2				2	
A1920	MRC 109	5				5	
A1930	MRC 110			2		2	
A2183	MRC 135		2			2	
B0440	Crane, M65		2			2	
B0630	Floodlight Unit	2	2			4	
B0645	Fork Attachment		1			1	
B0673	Freq Converter	1	2			3	
B0730	Gen, 3kw, 60 HZ	2	2			4	
B0891	Gen, 10kw, 60 HZ		1	2		3	
B0971	Gen, 30kw, 400 HZ		2			2	
B1224	Rkt Launcher	1				1	
B1690	100 Cu Reefer					4	1
B1700	630 Cu Reefer					3	2
B2463	Tractor, Case 1150	1				1	
B2465	Tractor, 72-31		1			1	
B2560	Forklift, 6000#	1	1			2	
C4000	A Pack, Field Range					12	3
C4436	Water Can					300	4
C4480	Cot, Folding						5

C4776	Fire Ext, 30#	7				7	
C4870	Fly Tent	5	5			10	
C4880	Food Container					40	6
C4980	Immersion Heater					30	7
C5820	Field Range					2	8
C6390	C P Tent	8	8	5		21	
C6410	G P Tent	63	22	0	0	85	9
C6420	Maint Tent	2				2	
D0215	Trlr, Refueler		2			2	
D0260	Trlr, M127	1				1	
D0840	Trlr, M416	20	7	4	6	37	
D0850	Trlr, 3/4 ton M101		4	4		8	
D0860	Trlr, M105	14				14	
D0880	Trlr, M149	4	4	2	1	11	
D0890	Trk, Amb M718	1	1	1		3	
D1015	Trk, M880		3	1		4	
D1020	Gama Goat	7				7	
D1030/40	Trk, 6x6 2-1/2 ton	25	2		2	29	
D1050	Trk, 5 Ton	2				2	
D1070	Trk, Dump M51	1				1	
D1110	Refueler, Diesel	2				2	
D1130	Trk, M52AZ		2			2	
D1160	Trk, M151	20	7	4	10	41	

NOTES:

1. Four are needed for the messhall.
2. Three are needed for the messhall.
3. Twelve are needed for the messhall.
4. 300 are supplied and drawn by the participating units as needed.
5. One cot per man is needed.
6. A specific number has not been furnished. The number shown is the amount used in CAXs 6-80 and 7-80.
7. See comment for note 6.
8. Two are needed for the messhall.
9. Based on 18 men per tent. HHQ and TEECG do not require tents.

APPENDIX A-4

STANDARD GROUND COMBAT EQUIPMENT

TAM#	NOMENCLATURE	INF BN	155mm HOW BATY	105mm HOW BATY	TANK CO.	AMPHIB ASSLT PLATOON	ANTI TK SECT	TOTAL
A0320	AN/GRA-6	12	8		2	1		23
A1730	AN/GRA-39A	15	8	6	10	1		40
A2040	AN/PRC-75A	5	2		4			11
A2050	AN/PRC-77	58	10	14	9			91
E0640	105mm Howitzer			6				6
E0663	155mm Howitzer		2					2
E0795	LVTC-7					2		2
E0845	LVTP-7					10		10
E0855	LVTR-7					1		1
E0892	M203 Gnd Launcher	81						81
E0900	66mm Rkt Launcher	12						12
E0980	.50 Cal Mach Gun	5			15	10		30
E0990	7.62mm Mach Gun	37			2	3		42
E1060	60mm Mortar	12						12
E1090	81mm Mortar	6						6
E1440	M16A1 Rifle	767						767
E1875	M60A1 Tank				17			17
E3175	Dragon	16						16
	TOW Wpn						8	8

APPENDIX A-5

STANDARD AIRCRAFT EQUIPMENT PACKAGE

TYPE AIRCRAFT	NUMBER
Det VMA/VMFA (A-4 or AV-8 or F-4)	4
Det VMA (AW) (A-6)	2
Det VMO (OV-10)	3
Det HMM (CH-46)	3
Det HMH (CH-53)	2
Det HML (UH-1)	2
Det HMA (AH-1)	4
Det VMFP (RF-4B)	2

APPENDIX A-6

QUANTITY OF CONSUMABLE SUPPLIES PURCHASED PER CAX

	NSN	PRICE PER UNIT ISSUE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
1.	00000000007505	$ 2.80	1	0	1	0	0	0	0
2.	00000000007511	3.53	1	0	1	0	0	0	0
3.	00000000009205	58.39	124	200	0	0	7	4	0
4.	000000000027502	1.17	300	6	19	102	0	0	0
5.	000000000027903	5.00	800	300	400	0	3	1	1
6.	000000000033301	1.60	1	5	6	0	0	0	0
7.	000000000061532	.37	25	12	0	48	83	7	0
8.	000000000064882	2.50	10	3	0	0	136	0	0
9.	0107LF7054001	5.25	0	1	4	0	0	0	0
10.	3439001848960	4.01	4	4	2	0	0	0	0
11.	3750000867690	2.42	3	18	0	5	11	0	4
12.	4210008892221	12.20	5	7	0	4	0	0	0
13.	4510001326376	1.60	10	9	0	0	0	0	0
14.	4720002033920	10.93	2	1	0	0	0	0	0
15.	4930002628868	2.76	1	6	0	0	5	0	0
16.	4930009650288	7.79	5	2	0	0	0	0	0
17.	5110001622205	4.38	4	2	8	39	25	0	0
18.	5110002405943	3.45	9	10	2	4	55	0	5

	NSN	PRICE PER UNIT ISSUE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
19.	5120002228852	$ .39	6	6	4	8	0	0	0
20.	5120002405328	2.88	2	6	0	0	3	0	0
21.	5120002514489	10.09	1	5	0	9	45	0	0
22.	5120002886564	2.21	4	10	10	36	174	90	6
23.	5120007561155	3.24	0	3	2	4	19	0	0
24.	5140004988898	3.04	9	0	1	4	26	0	0
25.	5315000104663	.30	50	0	50	0	0	0	0
26.	5340005822741	1.80	2	0	2	0	0	0	0
27.	5340006641319	1.85	8	0	7	0	0	0	0
28.	5350001925051	8.65	0	5	1	0	1	0	0
29.	5350002210872	8.76	0	4	1	0	23	0	6
30.	5350002402920	.85	2	2	0	34	1	33	0
31.	5510002206194	.24	1,227	637	96	300	1,273	192	0
32.	5530001297721	7.91	0	20	2	0	0	0	0
33.	5530001297833	16.33	0	5	10	3	14	0	0
34.	5530006186958	7.57	26	14	10	10	0	0	0
35.	5610002426012	3.90	68	30	0	65	67	0	0
36.	5970004194291	.82	64	92	20	120	189	0	23
37.	5970006443167	.52	48	0	0	20	6	58	38

	NSN	PRICE PER UNIT ISSUE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
38.	6135000503280	1.02	60	208	280	504	300	0	105
39.	6135001201020	3.17	487	156	8	1,186	831	0	0
40.	6135001255256	11.88	150	146	0	0	406	0	107
41.	6135004647584	23.73	100	152	49	155	186	0	108
42.	6135009268322	8.44	2,932	948	159	3,368	4,830	2,160	0
43.	6140000572553	62.71	6	0	6	0	7	0	0
44.	6145001607795	45.18	61	86	0	0	36	0	0
45.	6145002438466	61.57	114	30	29	80	100	0	70
46.	6145005482978	.11	3,000	0	4,000	2,189	12,410	0	0
47.	6145008418308	41.20	15	15	27	27	42	5	0
48.	6230001616422	3.03	20	0	10	0	8	0	0
49.	6230001631856	2.06	7	15	0	43	20	28	8
50.	6230006433486	1.70	0	18	8	0	0	0	0
51.	6240000660719	.12	31	320	0	100	0	300	0
52.	6240006354480	.12	13	350	0	266	489	360	216
53.	6250002319861	1.02	15	320	0	202	199	36	18
54.	6260001614296	1.60	7	2	0	8	10	0	0
55.	650801H022140	7.13	20	0	2	5	19	0	0
56.	681000499354	1.40	12	20	8	0	9	0	0

	NSN	PRICE PER UNIT ISSUE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
57.	6830002645913	45.52	2	1	0	2	0	4	0
58.	6840007822691	5.67	23	0	8	28	20	24	24
59.	6850001817929	2.97	50	0	18	0	100	0	6
60.	6850002246663	2.02	62	25	0	0	70	0	0
61.	6850002649037	52.90	1	14	6	12	2	0	0
62.	6850002811985	2.22	14	2	0	0	3	0	0
63.	7240000893827	9.40	10	0	5	0	0	0	0
64.	7240001600455	4.48	1	48	0	33	18	0	0
65.	7240006344802	7.83	1	1	0	0	0	0	0
66.	7340001798374	.97	417	155	96	332	650	320	320
67.	7340002053187	.80	356	105	112	289	650	320	320
68.	7340002053342	.92	240	115	80	429	650	0	8
69.	7350000825741	7.83	40	32	13	120	85	320	319
70.	7350006339743	19.26	70	36	22	201	200	75	75
71.	7510001614292	1.44	1	1	0	13	3	0	0
72.	7510002401526	1.44	1	6	0	9	21	35	31
73.	7510002644609	.60	1	2	0	0	3	0	0
74.	7510002644612	1.70	1	0	2	1	6	0	0
75.	7510002726887	.32	0	4	2	0	2	0	0

	NSN	PRICE PER UNIT ISSUE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
76.	7510002729662	.36	2	3	0	2	6	4	8
77.	7510002757212	1.70	2	2	0	5	0	5	0
78.	7510002815234	.46	4	4	0	41	3	3	0
79.	7510002861407	1.80	1	5	0	3	4	0	0
80.	7510002902026	1.08	18	20	2	10	37	0	2
81.	7510004365210	1.44	1	2	2	2	0	0	0
82.	7520002405503	.52	0	15	10	0	52	0	0
83.	7520002544610	.50	0	10	5	2	26	0	0
84.	7520002729683	4.16	4	0	2	2	0	0	0
85.	7520002815895	1.95	1	2	0	3	0	0	0
86.	7520002815931	6.18	0	1	1	1	2	0	0
87.	7520002987044	2.78	0	4	3	6	1	0	2
88.	7520002987045	1.34	10	10	12	0	0	0	0
89.	75209041265	1.08	1	8	1	1	9	0	0
90.	7520009041266	1.08	1	2	1	0	6	0	0
91.	7520009357136	1.44	8	10	0	34	40	12	11
92.	7520009731059	.13	0	20	5	36	24	0	0
93.	7520009731062	.14	0	10	5	64	13	0	0
94.	7530002223521	.89	0	15	8	37	97	0	0

	NSN	PRICE PER UNIT ISSUE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
95.	7530002223525	1.29	14	20	0	13	21	26	0
96.	7530002866173	8.03	2	12	0	0	5	0	0
97.	7530005150812	1.08	0	10	20	1	2	0	12
98.	7530006339866	?	1	2	4	0	0	0	0
99.	7920001775106	.90	8	5	0	0	1	0	0
100.	7920002051711	23.18	15	10	1	32	46	12	0
101.	7920002402559	.37	12	24	0	236	114	0	0
102.	7920002407174	.81	3	50	0	38	31	0	20
103.	7920002630328	1.13	0	5	3	2	1	0	0
104.	7920002922367	6.49	0	5	3	4	0	0	0
105.	7920002924375	3.61	4	5	0	12	9	3	0
106.	7920007535242	1.24	8	20	38	112	78	26	18
107.	7920008841116	.40	81	125	0	0	0	100	0
108.	7920009265176	.49	37	44	84	38	24	3	100
109.	7930002052868	.23	65	100	96	148	1,649	100	100
110.	7930005152477	1.65	23	2	0	0	13	0	0
111.	7930005262919	8.14	8	20	39	66	35	29	21
112.	8010002906983	.77	0	12	12	0	25	0	1
113.	8010002906984	.77	1	12	5	0	7	0	0

	NSN	PRICE PER UNIT ISSUE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
114.	8010005273198	7.42	0	4	7	0	0	0	0
115.	8010005825382	.77	3	0	2	24	27	12	24
116.	8010005843149	.77	16	0	12	12	53	0	5
117.	8010007219743	.77	18	24	4	42	20	0	0
118.	8010007219744	.77	3	0	5	36	18	0	0
119.	8020002454519	2.52	10	0	7	0	4	0	0
120.	8030002523391	.72	3	0	1	0	3	0	0
121.	8105006558286	11.64	56	0	2	59	92	57	47
122.	8135002395294	20.09	0	2	2	1	1	0	1
123.	8135002830671	57.44	0	4	1	7	23	0	0
124.	8415002668677	3.17	8	15	0	15	10	20	0
125.	8465010042893	4.52	0	1,089	200	72	146	0	10
126.	8520005279942	.42	32	5	0	0	13	0	0
127.	8520006341594	1.60	16	0	5	0	0	0	0
128.	8520009652109	.41	2	8	4	4	6	0	0
129.	8540002857001	28.84	14	0	1	21	22	15	15
130.	8540005303770	25.65	39	8	10	36	42	29	15
131.	854001H022149	24.92	0	2	1	0	0	0	0
132.	9130002646281	1.26	18,174	10,370	5,436	11,360	16,284	8,485	7,917

NSN	PRICE PER UNIT ISSUE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
133. 9140002426751	1.29	0	275	220	550	0	0	110
134. 9140002865294	1.29	23,582	37,972	19,692	21,015	61,671	27,814	20,677
135. 9150001889867	145.23	20	11	3	5	0	0	3
136. 9150001896729	153.73	23	16	1	89	10	0	0
137. 9150001900907	19.76	33	15	4	15	56	0	0
138. 9150001912772	153.73	30	5	4	35	2	1	0
139. 9150002319071	4.95	70	11	24	75	52	60	45
140. 9150002526378	4.06	34	28	0	0	0	0	0
141. 9150007534686	13.66	1	2	0	1	1	0	0
142. 9150009359808	4.03	38	0	20	0	3	160	0
143. 9150010355394	180.02	10	0	4	3	0	0	0
144. 9905005378954	4.38	5	14	3	4	33	0	0
145. 9905005378955	4.48	19	15	0	0	10	0	0
146. 9905005378956	4.48	15	10	0	5	24	1	13
147. 7530002220078	.49	12	10	5	60	101	0	12

APPENDIX A-7

CONSUMABLES COST FOR EACH CAX

	NSN	1-79	3-79	4-79	2-80 3-80	4-80	5-80	6-80	7-80
1.	0000000007505	2.80	0	2.80	0	0	0	0	0
2.	0000000007511	3.53	0	3.53	0	0	0	0	0
3.	0000000009205	7,240.36	11,678.00	0	0	58.39	175.17	233.56	0
4.	00000000027502	351.00	7.02	22.23	119.34	0	0	0	0
5.	00000000027903	4,000.00	1,500.00	2,000.00	0	0	0	5.00	5.00
6.	00000000033301	1.60	8.00	9.60	0	0	0	0	0
7.	00000000061532	9.25	4.44	0	17.76	1.11	.74	2.59	0
8.	00000000064882	25.00	7.50	0	0	5.00	107.50	0	0
9.	0107LF7054001	0	5.25	21.00	0	0	0	0	0
10.	3439001848960	16.04	16.04	8.02	0	0	0	0	0
11.	3750000867690	0	0	0	12.10	0	12.10	0	9.68
12.	4210008892221	61.00	85.40	0	48.80	0	0	0	0
13.	4510001326376	15.00	14.40	0	0	0	0	0	0
14.	4720002033920	21.86	10.93	0	0	0	0	0	0
15.	4930002628868	2.76	16.56	0	0	0	0	0	0
16.	4930009650288	38.95	15.58	0	0	0	0	0	0
17.	5110001622205	17.52	8.76	35.04	170.82	0	39.42	0	0
18.	5110002405943	31.05	34.50	6.90	13.80	0	20.70	0	17.25
19.	5120002228852	2.34	2.34	1.56	3.12	0	0	0	0

NSN	1-79	3-79	4-79	2-80 3-80	4-80	5-80	6-80	7-80
20. 5120002405328	5.76	17.28	0	0	0	5.76	0	0
21. 5120002514489	10.09	50.45	0	90.81	20.18	151.35	0	0
22. 5120002886564	8.84	22.10	22.10	79.56	13.26	0	198.90	13.26
23. 5120007561155	0	9.72	6.48	12.96	0	6.48	0	0
24. 5120008891796	0	0	0	0	0	44.80	0	0
25. 5140004988898	27.36	0	3.04	12.16	6.08	0	0	0
26. 5315000104663	15.00	0	15.00	0	0	0	0	0
27. 5340005822741	3.60	0	3.60	0	0	0	0	0
28. 5340006641319	14.80	0	12.95	0	0	0	0	0
29. 5350001925051	0	43.25	8.65	0	0	0	0	0
30. 5350002210872	0	35.04	8.76	0	0	0	0	52.56
31. 5350002402920	1.70	1.70	0	28.90	0	.85	28.05	0
32. 5510002206194	294.48	152.88	23.04	72.00	0	21.12	46.08	0
33. 5530001285531	17.95	0	0	0	0	0	107.70	0
34. 5530001297721	0	158.20	15.82	0	0	0	0	0
35. 5530001297833	0	81.65	163.30	48.99	0	0	0	0
36. 5530006186958	196.82	105.98	75.70	75.70	0	0	0	0
37. 5610002426012	265.82	117.00	0	253.50	15.60	0	0	0
38. 5970004194291	52.48	75.44	16.40	98.40	0	91.84	0	18.86
39. 5970006443167	24.96	0	2.60	10.40	3.12	0	30.16	19.76
40. 6135000503280	61.20	212.16	285.60	514.08	306.00	0	0	0

	NSN	1-79	3-79	4-79	2-80 3-80	4-80	5-80	6-80	7-80
41.	6135001201020	1,543.79	494.52	25.36	3,784.98	497.69	0	0	0
42.	6135001255256	1,782.00	1,734.48	0	0	1,306.80	1,425.60	0	1,104.84
43.	6135004647584	2,373.00	3,606.96	1,162.77	3,678.15	1,850.94	664.44	0	0
44.	6135009268322	24,746.08	8,001.12	1,341.96	28,425.92	3,342.24	38,266.96	18,230.40	0
45.	6140000572554	376.26	0	376.26	0	0	438.97	0	0
46.	6145001607795	2,755.98	3,885.48	0	0	0	0	0	0
47.	6145002438466	7,018.98	1,847.10	1,785.53	4,925.60	2,462.80	0	0	2,154.95
48.	6145005482978	330.00	0	440.00	240.79	0	220.00	0	0
49.	6145008418308	618.00	618.00	1,112.40	1,112.40	82.40	164.80	0	0
50.	6230001616422	60.60	0	30.30	0	0	0	0	0
51.	6230001631856	14.42	30.90	0	88.58	0	32.96	57.68	16.48
52.	6230006433486	0	30.60	13.60	0	0	0	0	0
53.	6240000550719	3.72	38.40	0	12.00	0	0	36.00	0
54.	624006354480	1.56	42.00	0	39.92	0	44.28	43.20	25.92
55.	6250002319861	15.30	326.40	0	206.04	0	0	36.72	18.36
56.	6260001614296	11.20	3.20	0	12.80	0	12.80	0	0
57.	650801H022140	142.60	0	14.26	35.65	14.26	42.78	0	0
58.	681000499354	16.80	28.00	11.20	0	4.20	0	0	0
59.	6830002645913	91.04	45.52	0	91.04	0	0	182.08	0
60.	6840007822691	130.41	0	45.36	158.76	0	0	136.08	136.08
61.	6850001817929	148.50	0	53.46	0	0	148.50	0	17.82

	NSN	1-79	3-79	4-79	2-80 3-80	4-80	5-80	6-80	7-80
62.	6850002246663	125.24	50.50	0	0	12.12	107.06	0	0
63.	6850002649037	52.99	741.86	317.94	635.88	105.98	0	0	0
64.	6850002811985	31.08	4.44	0	0	0	0	0	0
65.	7240000893827	94.00	0	47.00	0	0	0	0	0
66.	7240001600455	4.48	215.04	0	147.84	0	40.32	0	0
67.	7240006344802	7.83	7.83	0	0	0	0	0	0
68.	7340001708374	404.49	150.04	93.12	322.04	0	0	0	310.4
69.	7340002053187	284.80	84.00	89.60	231.20	0	0	0	256.0
70.	7340002053342	220.80	105.80	73.60	394.68	0	0	0	7.36
71.	7350000825741	313.20	250.56	101.79	939.60	0	0	0	2,497.77
72.	7350006339743	1,348.20	693.36	423.72	3,871.26	0	0	0	1,444.50
73.	7510001614292	1.44	1.44	0	18.72	0	0	0	0
74.	7510002401526	1.44	8.64	0	12.96	1.44	18.72	50.40	44.64
75.	7510002644609	.60	1.20	0	0	.60	0	0	0
76.	7510002644612	1.70	0	3.40	1.70	0	10.20	0	0
77.	7510002726887	0	1.28	.64	0	0	0	0	0
78.	7510002729662	.72	1.08	0	.72	0	1.8	1.44	2.88
79.	7510002757212	3.40	3.40	0	8.50	0	0	8.5	0
80.	7510002815234	1.84	1.84	0	18.86	0	0	1.38	0
81.	7510002861407	1.80	9.00	0	5.40	0	1.80	0	0
82.	7510002902026	19.44	21.60	2.16	10.80	2.16	2.16	0	2.16

	NSN	1-79	3-79	4-79	2-80 3-80	4-80	5-80	6-80	7-80
83.	7510004365210	1.44	2.88	2.88	2.88	0	0	0	0
84.	7520002405503	0	7.80	5.20	0	0	27.04	0	0
85.	7520002644610	0	5.00	2.50	1.00	0	0	0	0
86.	7520002729683	16.64	0	8.32	8.32	0	0	0	0
87.	7520002815895	1.95	3.90	0	5.85	0	0	0	0
88.	7520002815931	0	6.18	6.18	6.18	0	6.18	0	0
89.	7520002987044	0	11.12	8.34	16.68	0	0	0	5.56
90.	7520002987045	13.40	13.40	16.08	0	0	0	0	0
91.	7520009041265	1.08	8.64	1.08	1.08	0	7.56	0	0
92.	7520009041266	1.08	2.16	1.08	0	0	2.16	0	0
93.	7520009357136	11.52	14.40	0	48.96	2.88	33.12	17.28	15.84
94.	7520009731059	0	2.60	.65	4.68	0	1.56	0	0
95.	7520009731062	0	1.40	.70	8.96	0	0	0	0
96.	7530002224521	0	13.35	7.12	32.93	0	.89	0	0
97.	7530002223525	18.06	25.80	0	16.77	0	7.74	33.54	0
98.	7530002866173	16.06	96.36	0	0	8.03	0	0	0
99.	7530005150812	0	10.80	21.60	1.08	0	2.16	0	12.96
100.	7350006339866						0	0	0
101.	7920001775106	7.20	4.50	0	0	0	.90	0	0
102.	7920002051711	347.70	231.80	23.18	741.76	46.36	301.34	278.16	0
103.	7920002402559	4.44	8.88	0	87.32	0	4.44	0	0

NSN	1-79	3-79	4-79	2-80 3-80	4-80	5-80	6-80	7-80
104. 7920002407174	2.43	40.50	0	30.78	0	24.30	0	16.2
105. 7920002630328	0	5.65	3.39	2.26	0	1.13	0	0
106. 7920002922367	0	32.45	19.47	25.96	0	0	0	0
107. 7920002924375	14.44	18.05	0	43.32	0	25.27	10.83	0
108. 7920007535242	9.92	24.80	47.12	138.88	0	76.88	32.24	22.32
109. 7920008841116	32.40	50.00	0	0	0	0	40.00	0
110. 7920009265176	18.13	21.56	41.16	18.62	0	11.76	1.47	49.00
111. 7930002052868	14.95	23.00	22.08	34.04	0	379.27	23.00	23.00
112. 7930005152477	37.95	3.30	0	0	0	0	0	0
113. 7930005262919	65.12	162.80	317.46	537.24	0	48.84	236.06	170.94
114. 8010002906983	0	9.24	9.24	0	0	0	0	.77
115. 8010002906984	.77	9.24	3.85	0	0	0	0	0
116. 8010005273198	0	29.68	51.94	0	0	0	0	0
117. 8010005825382	2.31	0	1.54	18.48	0	2.31	9.24	9.24
118. 8010005843149	12.32	0	9.24	9.24	0	0	0	3.85
119. 8010007219743	13.86	18.48	3.08	32.34	0	6.16	0	0
120. 8010007219744	2.31	0	3.85	27.72	0	4.62	0	0
121. 8020002454519	25.20	0	17.64	0	0	0	0	0
122. 8030002523391	2.16	0	.72	0	0	0	0	0
123. 8105006558286	651.84	0	23.28	686.76	0	314.28	663.48	547.08
124. 8135002395294	0	40.18	40.18	20.09	0	0	0	20.09

	NSN	1-79	3-79	4-79	2-80 3-80	4-80	5-80	6-80	7-80
125.	8135002830671	0	229.76	57.44	402.08	0	689.28	0	0
126.	8415002668677	25.36	47.55	0	47.55	0	31.7	31.7	0
127.	8465010042893	0	4,922.28	904.00	325.44	0	9.04	0	45.20
128.	8520005279942	13.44	2.10	0	0	0	0	0	0
129.	8520006341594	25.60	0	8.00	0	0	0	0	0
130.	8520009652109	.82	3.28	1.64	1.64	0	0	0	0
131.	8540002857001	403.76	0	28.84	605.54	0	0	0	0
132.	8540005303770	1,000.35	205.20	256.50	923.40	0	51.30	743.85	384.75
133.	854001H022149	0	49.84	24.92	0	0	0	0	0
134.	9130002646281	22,899.24	13,066.20	6,849.36	14,313.60	10,900.00	9,630.18	10,691.10	9,975.42
135.	9140002426751	0	354.75	283.80	709.50	0	0	0	141.90
136.	9140002865294	30,420.78	48,983.88	25,402.68	27,109.35	40,445.37	39,110.22	35,880.06	25,244.01
137.	9150001889867	2,904.60	1,597.53	435.69	726.15	0	0	0	435.69
138.	9150001896729	3.535.79	2,459.68	153.73	13,681.97	1,537.30	0	0	0
139.	9150001900907	652.08	296.40	79.04	296.40	98.90	652.08	0	0
140.	9150001912772	4,611.90	768.65	614.92	5,380.55	307.46	0	153.73	0
141.	9150002319071	346.50	54.45	118.80	371.25	49.50	99.00	297.00	0
142.	9150002526378	138.04	113.68	0	0	0	0	0	0
143.	9150007534686	13.66	27.32	0	13.66	0	0	0	0
144.	9150009359808	153.14	0	80.60	0	12.09	0	644.8	0
145.	9150010355394	1,800.20	0	720.08	540.06	0	0	0	0

	NSN	1-79	3-79	4-79	2-80 3-80	4-80	5-80	6-80	7-80
146.	9905005378954	21.90	61.32	13.14	17.52	0	65.7	0	0
147.	9905005378955	85.12	67.20	0	0	0	44.8	0	0
148.	9905005378956	67.20	44.80	0	22.40	0	53.76	4.48	58.24
149.	7530002220078	5.88	4.90	2.45	29.40	0	11.76	0	5.88

APPENDIX A-8

MOST EXPENSIVE CONSUMABLE SUPPLY ITEMS

		1-79	3-79	4-79	2-80 3-80	4-80 5-80	6-80	7-80
TOTAL SUPPLY COST =		$128,952	$111,948	$ 62,581	$119,236	$192,400	$ 93,547	$ 53,938

SUPPLY TYPE	NSN	1-79	3-79	4-79	2-80 3-80	4-80 5-80	6-80	7-80
BATTERIES:								
BA30	6135001201020	1,544	495	25	3,785	2,635	0	0
BA414	6135001255256	1,782	1,734	0	0	4,823	0	1,271
BA3553	6135004647584	2,373	3,607	1,163	3,678	4,414	0	2,563
BA4386	6135009268322	24,746	8,001	1,342	28,426	41,609	18,230	0
	SUBTOTAL:	$ 30,445	$ 13,837	$ 2,530	$ 35,889	$ 53,481	$ 18,230	$ 3,834
	% TOTAL:	24%	12%	4%	30%	28%	19.5%	7%
WIRE:								
w/outer cover	6145001607795	2,756	3,885	0	0	1,626	0	0
w-o/outer cover	6145002438466	7,019	1,847	1,786	4,926	6,157	0	4,310
	SUBTOTAL:	$ 9,775	$ 5,732	$ 1,886	$ 4,926	$ 7,783	0	$ 4,310
	% TOTAL:	8%	5%	3%	4%	4%		8%
FUEL:								
Gasoline	9130002646281	22,899	13,066	6,849	14,314	20,530	10,691	9,975
Diesel	9140002865294	30,421	48,984	25,403	27,109	79,565	35,880	26,673
	SUBTOTAL:	$ 53,320	$ 62,050	$ 31,892	$ 41,423	$100,095	$ 46,571	$ 36,648
	% TOTAL:	41%	55%	51%	35%	52%	50%	68%
LUBE OIL:								
OE-50	9150001889867	2,905	1,598	436	726	0	0	436
OE-30	9150001896729	3,536	2,460	154	13,682	1,537	0	0
Grade 10	9150001912772	4,612	769	615	5,381	307	154	0
Gear Univ Oil	9150010355394	1,800		720	540	0	0	0
	SUBTOTAL:	$ 12,853	$ 4,827	$ 1,925	$ 20,329	$ 1,844	$ 154	$ 436
	% TOTAL:	10%	4%	3%	17%	1%	.2%	1%
	TOTAL %	83%	76%	61%	86%	85%	70%	84%

AVG % = 78%

APPENDIX A-9

FUEL CONSUMPTION FOR COMBATANT AND NONCOMBATANT EQUIPMENT

TAM#	NOMEN	TYPE FUEL	GAL/DAY	#DAYS	GAL/MA/CAX	#MACH	TOT GAL/CAX
A0265	MRC-87	G	14	6	84	3	252
A1900	MRC-83	G	14	6	84	2	168
A1920	MRC-109	G	14	10	140	5	700
A1930	MRC-110	G	14	10	140	2	280
A2183	MRC-135	G	14	5	70	2	140
B0440	Crane,M65	D	18	15	270	1	270
B0630	Floodlight Unit	D	4.5	15	67.5	4	270
B0730	Gen,3 KW,60HZ	G	12	15	180	4	720
B0891	Gen,10KW,60HZ	D	21.2	15	318	3	954
B0971	Gen,30KW,400HZ	D	60	6	360	2	720
B2463	Tractor,Casell 50	D	60	10	600	1	600
B2465	Tractor,72-31	D	36	10	360	1	360
B2560	Truck,Forklift	D	24	15	360	2	720
C4980	Immersion Heater	G	3	15	45	30	1,350
C5820	Field Range	G	9	15	135	2	270
D0215	TRLR,Refueler	D	4.5	10	45	2	90
D0890	Trk,Ambulance	G	18	10	180	3	540

TAM#	NOMEN	TYPE FUEL	GAL/DAY	#DAYS	GAL/MA/CAX	#MACH	TOT GAL/CAX
D1015	Trk,M880	G	16.4	15	246	4	984
D1020	Trk,M561	D	32	10	320	7	2,240
D1030/40	Trk,4x4,1/2T	D	42.64	15	639.6	29	18,548.4
D1050	Trk,5T	D	42.64	15	639.6	3	1,918
D1070	Trk, Dump	D	42.64	6	255.8	1	255.8
D1110	Trk, Refueler	D	32	10	320	2	640
D1130	Trk,5T,M52AZ	D	42.64	5	213.2	2	426.4
D1160	Trk, Utility	G	12	15	180	41	7,380
E0663	How,155MM SP	D	30	3	90	2	180
E0795	LVTC-7	D	125	3	375	2	750
E0845	LVTP-7	D	125	3	375	10	3,750
E0855	LVTR-7	D	125	3	375	1	375
E1875	Tank,M60A1	D	100	3	300	17	5,100

GAS = 12,784 gallons
DIESEL = 38,168 gallons
TOTAL 50,952 gallons

APPENDIX A-10

ESTIMATED NUMBER OF RADIO BATTERIES NEEDED FOR A CAX

TAM#	NOMEN	#USED	BTRY TYPE	BTRYS HELD	USAGE FACTOR	#BTRYS REQUIRED
A0320	AN/GRA-6	23	BA-414	1	4.8	110
A1730	AN/GRA-39A	40	BA-30	1	4.8	192
A2040	AN/PRC-75A	11	BA-3553	1	4.8	53
A2050	AN/PRC-77	91	BA-4386	1	4.8	437

APPENDIX A-11

ESTIMATED ROLLS OF WIRE NEEDED FOR A CAX

NSN	NOMENCLATURE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
6145001607795	Phone Cable w/outer case	61	86	0	0	36*	0	0
6145002438466	Phone Cable w-o/outer case	114	30	29	80*	100*	0	70

Avg Number w/outer case = 45 rolls**

Avg Number w-o/outer case = 44 rolls***

* This was the amount purchased for two CAXs. This must be remembered when calculating the Avg Number per CAX.

** The CAXs which specified that no wire was purchased were not used when calculating the average number.

*** The 114 rolls purchased for CAX 1-79 was not used in calculating the average number of rolls per CAX. Because this amount is so much larger than the amounts purchased in the other CAXs, it was dismissed as being an unrealistic quantity.

Note: The amounts shown are the amounts that were purchased and charged as a CAX cost. The actual amount used is unknown as actual usage data was not recorded.

APPENDIX A-12

ESTIMATED DRUMS OF LUBE OIL FOR A CAX

NSN	NOMENCLATURE	1-79	3-79	4-79	2-80 3-80	4-80 and 5-80	6-80	7-80
9150001889867	OE-50	20	11	3	5	0	0	3
9150001896729	OE-30	23	16	1	89	10	0	0
9150001912772	Grade 10	30	5	4	35	2	1	
9150010355394	Gear Univ Oil	10	0	4	3	0	0	0

Avg OE-50 = 8 Drums (See Note 1)

Avg OE-30 = 23 Drums (See Note 2)

Grade 10 = 10 Drums

Avg Gear Univ Oil = 4 Drums (See Note 1)

NOTES:

1. Those CAXs in which none were purchased were not used in calculating the average number.
2. The one drum recorded for CAX 4-79 was not used in calculating the average number as it is considered to be an unrealistically low number.

APPENDIX A-13

NUMBER OF ROUNDS EXPENDED PER TYPE OF WPN PER CAX FOR GROUND WEAPONS

M16 Rifle

DODIC	1-79	2-79	3-79	2-80	3-80	4-80	5-80	6-80	7-80
A068	3,600	0	0	3,280	8,808	2,880	3,280	8,200	7,180
A071	64,680	0	0	40,360	40,320	110,040	99,080	31,080	208,320
A080	29,120	0	0	19,640	22,080	45,600	0	23,440	101,280
					M60 Machine Gun				
A111	8,000	0	0	9,800	21,250	7,600	3,100	0	10,400
A131	60,800	0	0	32,200	45,800	52,000	53,700	68,100	48,000
					Cal. 50 Machine Gun				
A576	5,000	0	0	0	3,600	0	0	70	0
A589	70	0	0	4,955	0	3,060	0	26,010	6,970
					M203 Grenade Launcher				
B534	112	0	0	0	240	100	200	496	120
B535	0	0	0	0	572	286	170	247	7
B536	71	0	0	0	0	0	0	0	0
B546	0	0	0	0	416	0	0	0	0
B547	1,483	0	0	0	0	0	0	192	0
B568	0	0	0	0	0	504	500	0	0
B569	0	0	0	0	0	0	0	792	416
B577	300	0	0	0	264	144	0	720	0
					60MM Mortar				
B627	340	108	0	41	63	198	292	79	87
B630	220	90	0	116	27	230	0	108	72
B632	950	557	0	612	478	600	1,179	611	643
B634	200	0	0	0	0	0	0	0	0
					81MM Mortar				
C226	301	50	48	126	147	264	115	96	150
C256	999	402	132	648	547	1,908	433	999	861
C276	183	45	12	66	66	252	162	200	139
					105 MM Howitzer				
C443	0	0	230	160	776	374	855	960	210
C444	450	1,008	450	755	0	0	0	0	0
C448	0	0	0	0	0	1	0	0	0
C449	90	21	103	140	280	54	12	280	82
C452	30	68	75	20	70	0	0	50	202
C454	60	163	0	11	224	50	56	200	304
C463	0	0	0	0	1	0	0	0	0
C477	0	0	136	0	0	0	0	0	0

DODIC	1-79	2-79	3-79	2-80	3-80	4-80	5-80	6-80	7-80
					M60 Tank				
C503	75	0	0	0	0	0	0	0	0
C510	0	0	50	50	50	168	128	0	0
C511	100	340	90	60	60	72	72	430	312
C512	10	51	24	26	26	48	48	180	36
C519	0	0	0	0	0	0	0	28	20
C520	0	0	100	50	50	0	0	550	60
					175MM Gun				
D361	256	0	0	0	0	0	0	0	0
					155MM Howitzer				
D505	32	32	0	0	32	0	0	0	0
D540	137	136	0	0	60	0	0	0	0
D541	200	200	0	0	184	0	0	0	0
D544	248	248	0	0	248	0	0	0	0
D548	0	8	0	0	8	0	0	0	0
D550	48	48	0	0	16	0	0	0	0
D572	240	0	0	0	0	0	0	0	0
					Hand Grenades				
G878	0	0	0	0	0	0	0	0	0
G881	21	0	0	0	360	0	136	362	0
G895	23	0	0	0	2	9	0	24	28
G924	0	0	0	0	38	0	0	25	0
G930	40	32	0	47	32	44	50	126	42
G940	34	53	0	32	95	18	44	147	32
G945	53	47	36	68	61	70	70	96	128
G950	31	63	23	41	50	50	30	82	16
G963	16	0	0	22	0	27	0	64	0
					LAW				
H110	12	0	0	0	0	0	0	0	0
H557	285	0	0	90	90	250	194	345	114
					MK22 Rocket Motor				
J143	4	1	1	0	0	0	1	441	4
					Signals				
L225	50	0	0	12	60	15	0	80	0
L226	70	0	0	5	50	15	1	70	47
L227	60	0	0	8	50	15	0	80	0
L306	48	0	0	33	5	20	28	50	18
L307	50	34	0	116	72	39	10	38	58
L311	12	20	0	25	23	0	26	30	36
L312	150	67	0	119	144	80	49	142	52
L314	58	33	20	101	142	78	64	0	48
L323	16	0	0	33	0	0	5	0	0

DODIC	1-79	2-79	3-79	2-80	3-80	4-80	5-80	6-80	7-80
L324	25	28	0	62	112	20	14	0	0
L495	31	0	0	0	0	3	0	32	0
L596	0	0	0	0	0	0	0	30	0
L598	46	0	0	0	0	30	1	300	0
L599	0	0	0	0	0	30	0	215	0
Demolitions									
M028	15	6	0	4	4	2	2	10	3
M030	515	0	0	167	0	30	43	192	150
M032	115	0	0	244	30	25	20	144	112
M039	10	0	0	1	3	0	3	5	2
M097	0	0	0	4	0	0	0	4	4
M098	0	0	0	7	0	0	0	4	4
M130	54	24	0	184	45	30	20	186	37
M131	580	60	130	165	100	60	35	165	261
M327	0	0	0	11	0	0	0	0	11
M420	4	0	0	3	0	0	0	3	1
M421	4	0	0	2	2	0	0	3	1
M456	4,500	0	0	1,600	2,000	500	325	1,675	1,600
M591	100	0	0	100	50	0	0	50	35
M626	0	0	0	3	0	0	0	5	0
M627	0	0	0	12	3	0	0	14	0
M630	0	0	0	10	0	0	0	10	0
M670	4,600	500	1,000	1,000	800	200	250	1,000	500
M757	6	6	7	14	9	2	2	8	0
M766	555	50	65	200	109	0	50	300	103
M810	0	0	0	62	0	50	0	62	0
M913	2	1	1	1	2	2	0	2	2
M914	2	0	0	0	0	0	1	1	1
Fuzes & Primers									
N248	32	32	0	0	0	0	0	0	0
N276	0	8	0	0	0	0	0	0	0
N278	74	25	0	0	10	0	0	0	10
N335	208	208	126	0	0	1,106	0	0	0
N402	0	0	0	0	2	60	0	0	23
N411	48	0	0	0	0	0	0	0	0
N412	100	101	0	0	50	332	7	50	25
N463	16	64	13	0	0	0	0	0	0
N523	350	350	0	0	0	0	0	0	0
N525	1,000	0	0	0	0	0	0	0	0
Tow									
PA66	8	0	0	4	2	3	8	2	4
Dragon									
PL23	12	4	0	16	5	8	12	16	12

APPENDIX A-14

GROUND AMMUNITION COSTS REPORTS
CAX 1-79

Weapon	DODIC	Qty Expended	Price	Cost
M16A1 Rifle	A068	3,600	.2342	$ 843
	A071	64,680	.1550	10,025
	A080	29,120	.0992	2,889
			Total M16A1	$ 13,919
M60 Mach Gun	A111	8,000	.2192	$ 1,754
	A131	60,800	.2867	17,431
			Total M60 Mach Gun	$ 19,185
Cal .50 Mach Gun	A576	5,000	.4836	$ 2,418
	A589	70	.4836	34
			Total Cal .50 Mach	$ 2,452
M203 Grenade Launcher	B534	112	9.2877	$ 1,040
	B536	71	5.3419	379
	B567	72	3.3584	242
	B569	1,483	21.5110	31,901
	B577	300	2.5022	751
			Total	$ 34,313
60mm Mortar	B627	340	98.0440	$ 33,335
	B630	220	71.0159	15,623
	B632	950	55.9892	53,190
	B634	200	40.4419	8,088
			Total	$110,236
81mm Mortar	C226	301	107.3830	$ 32,322
	C256	999	95.2880	95,193
	C276	183	92.8515	16,992
			Total	$144,507
105mm Howitzer	C444	450	81.8668	$ 36,840
	C449	90	176.8607	15,917
	C452	30	267.6040	8,028
	C454	60	97.0010	5,820
				$ 66,605
M60 Tank	C503	75	110.1345	$ 8,260
	C511	100	177.3284	17,732
	C512	10	296.6580	2,967
			Total	$ 28,959

Weapon	DODIC	Qty Expended	Price	Cost
155mm Howitzer	D505	32	262.9480	$ 8,414
	D540	137	116.4677	15,956
	D541	200	143.6578	28,732
	D544	248	145.0380	35,969
	D550	48	134.8340	6,472
			Total	$ 95,543
175mm Gun	D361	256	260.8623	$ 66,781
	D572	240	235.0025	56,401
			Total	$ 123,182
Hand Grenades	G881	21	7.0576	$ 148
	G895	23	11.7827	271
	G930	40	12.1461	486
	G940	34	14.1180	480
	G945	53	16.5420	877
	G950	31	15.0360	466
	G963	16	18.5914	297
			Total	$ 3,025
LAW	H110	12	449.6200	$ 5,935
	H557	285	95.8595	27,320
			Total	$ 32,715
Rocket Launcher Gnd and firing kit	J143	4	921.8134	$ 3,687
Signals	L225	50	12.4704	$ 624
	L226	70	14.2484	997
	L227	60	16.8297	1,010
	L306	48	24.2410	1,164
	L307	50	36.6015	1,830
	L311	12	36.6783	404
	L312	150	19.6934	2,954
	L314	58	23.9382	1,388
	L323	16	21.9889	352
	L324	25	26.7669	669
	L495	31	14.6333	454
	L598	46	12.2626	564
			Total	$ 12,410

Weapon	DODIC	Qty Expended	Price	Cost
Demolitions	M028	15	504.5214	$ 7,568
	M030	515	1.8405	948
	M032	115	3.4181	393
	M039	10	97.4830	975
	M130	54	1.9757	107
	M131	580	.5919	343
	M420	4	134.1484	537
	M421	4	320.5846	1,282
	M456	4,500	.0671	302
	M591	100	.9435	94
	M670	4,600	.2682	1,234
	M757	6	156.5510	939
	M766	555	2.1375	1,186
	M913	2	5,566.4285	11,133
	M914	2	3,769.2174	7,538
			Total	$ 34,579
Fuzes & Primers	N248	32	37.5240	$ 1,201
	N278	74	46.0230	3,406
	N335	208	13.3271	2,772
	N411	48	70.5112	3,385
	N412	100	67.5789	6,758
	N463	16	64.3321	1,029
	N523	350	.5919	207
	N525	1,000	1.4820	1,482
			Total	$ 20,240
TWO WPN SYSTEM	PA66	8	3,549.68	$ 28,397
	PA67	8	.65	5
			Total	$ 28,402
Dragon WPN System	PL23	12	2,487.96	$ 29,856

TOTAL AMMUNITION COSTS = $803,815

CAX 2-79

M16 Rifle	A011	40	.4510	18
60MM Mortar	B627	108	98.0440	$ 10,589
	B630	90	71.0159	6,391
	B632	557	55.9892	31,186
			Total	$ 48,166

Weapon	DODIC	Qty Expended	Price	Cost
81MM Mortar	C226	50	107.3830	$ 5,639
	C256	402	95.2880	38,306
	C276	45	92.8515	4,178
			Total	$ 48,123
105MM Howitzer	C444	1,008	81.8668	$ 82,522
	C449	21	176.8607	3,714
	C452	68	267.6040	18,197
	C454	163	97.0010	15,811
			Total	$120,244
M60 Tank	C511	340	177.3284	$ 60,292
	C512	51	296.6580	15,130
			Total	$ 75,422
155 Howitzer	D505	32	262.9480	$ 8,414
	D540	136	116.4677	15,840
	D541	200	143.6578	28,732
	D544	248	145.0380	35,969
	D548	8	42.3925	339
	D550	48	134.8340	6,472
			Total	$ 95,766
Hand Grenades	G930	32	12.1461	$ 389
	G940	53	14.1880	752
	G945	47	16.5420	777
	G950	63	15.0360	947
			Total	$ 2,865
Rocket Launcher Gnd and Firing Kit	J143	1	921.8134	$ 922
Signals	L307	34	36.6015	$ 1,244
	L311	20	33.6783	674
	L312	67	19.6934	1,319
	L314	33	23.9382	790
	L324	28	26.7669	749
			Total	$ 4,776
Demolitions	M028	6	504.5214	$ 3,027
	M130	24	1.9757	47
	M131	60	.5919	36
	M670	500	.2682	134
	M766	50	2.1375	107
	M757	6	156.5510	939
	M913	1	5,566.4285	5,566
			Total	$ 9,856

Weapon	DODIC	Qty Expended	Price	Cost
Fuzes & Primers	N248	32	37.5240	$ 1,201
	N276	8	24.5129	196
	N278	25	40.0233	1,001
	N335	208	13.3271	2,772
	N412	101	67.5789	6,825
	N463	64	64.3321	4,117
	N523	350	.5919	207
			Total	$ 16,219
Dragon	PL23	4	2,487.96	$ 9,952

TOTAL AMMUNITION COST = $432,329

Weapon	DODIC	Qty Expended	Price	Cost
81MM Mortar	C226	48	107.3830	$ 5,154
	C256	132	95.2880	12,578
	C276	12	92.8515	1,114
			Total	$ 18,846
105MM Howitzer	C443	230	122.0461	$ 28,071
	C444	450	81.8668	36,840
	C449	103	176.8607	18,217
	C452	75	267.6040	20,070
	C477	136	73.5011	9,996
			Total	$113,194
M60 Tank	C510	50	145.7417	$ 7,287
	C511	90	177.3284	15,960
	C512	24	296.6580	7,120
	C520	100	163.2672	16,327
			Total	$ 46,694
Hand Grenades	C945	36	16.542	$ 596
	C950	23	15.036	346
			Total	$ 942
Rocket Launcher Gnd and Firing Kit	J143	1	921.8134	$ 922
Signals	L314	20	23.9382	$ 479
Demolitions	M131	130	.5919	$ 77
	M670	1,000	.2682	268
	M757	7	156.5510	1,096
	M766	65	2.1375	139
	M913	1	5,566.4285	5,566
			Total	$ 7,146

Weapon	DODIC	Qty Expended	Price	Cost
Fuzes & Primes	N335	126	13.3271	$ 1,679
	N463	13	64.3321	836
			Total	$ 2,515

TOTAL AMMUNITION COST = $90,738

CAX 2-80

Weapon	DODIC	Qty Expended	Price	Cost
M16 Rifle	A068	3,280	.2342	$ 768
	A071	40,360	.1550	6,256
	A080	19,640	.0992	1,948
			Total	$ 8,972
M60 Mach Gun	A111	9,800	.1292	$ 2,148
	A131	32,200	.2867	9,232
			Total	$ 11,380
Cal.50 Mach Gun	A589	4,955	.4836	$ 2,396
60MM Mortar	B627	41	98.0440	$ 4,020
	B630	116	71.0159	8,238
	B632	612	55.9892	34,265
			Total	$ 46,523
81MM Mortar	C226	126	107.3830	$ 13,530
	C256	648	95.2880	61,747
	C276	66	92.8515	6,128
			Total	$ 81,405
105MM Howitzer	C443	160	122.0461	$ 19,527
	C444	755	81.8668	61,809
	C449	140	176.8607	24,760
	C452	20	267.6040	5,352
	C454	11	97.0010	1,067
			Total	$112,515
M60 Tank	C510	50	145.7417	$ 7,287
	C511	60	177.3284	10,640
	C512	26	296.6580	7,713
	C520	50	163.2672	8,163
			Total	$ 33,803

Weapon	DODIC	Qty Expended	Price	Cost
Hand Grenades	G930	47	12.1461	$ 571
	G940	32	14.1880	545
	G945	68	16.5420	1,125
	G950	41	15.0360	616
	G963	22	18.5914	409
			Total	$ 3,175
LAW	H557	90	95.8595	$ 8,627
Signals	L225	12	12.4704	$ 150
	L226	5	14.2484	71
	L227	8	16.8297	135
	L306	33	24.2410	800
	L307	116	36.6015	4,246
	L311	25	33.6783	842
	L312	119	19.6934	2,344
	L314	101	23.9382	2,418
	L323	33	21.9889	726
	L324	62	26.7669	1,660
			Total	$ 13,392
Demolitions	M028	4	504.5214	$ 2,018
	M030	167	1.8405	307
	M032	244	3.4181	834
	M039	1	97.4830	97
	M097	4	.4354	2
	M098	7	1.2380	9
	M130	184	1.9757	364
	M131	165	.5919	98
	M327	11	.1509	2
	M420	3	134.1484	402
	M421	2	320.5846	641
	M456	1,600	.0671	107
	M591	100	.9435	94
	M626	3	3.6138	11
	M627	12	4.2157	51
	M630	10	7.1131	71
	M670	1,000	.2682	268
	M757	14	156.5510	2,192
	M766	200	2.1375	428
	M810	62	.0477	3
	M913	1	5,566.4285	5,566
			Total	$ 13,567
TOW	PA66	4	3,549.68	$ 14,199
Dragon	PL23	16	2,487.96	$ 39,807

TOTAL AMMUNITION COST = $387,365

CAX 3-80

Weapon	DODIC	Qty Expended	Price	Cost
M16 Rifle	A068	8,808	.2432	$ 2,063
	A071	40,320	.1550	6,250
	A080	22,080	.0992	2,190
			Total	$ 10,503
M60 Mach Gun	A111	21,250	.2192	$ 4,658
	A113	45,800	.2867	13,131
			Total	$ 17,789
Cal.50 Mach Gun	A576	3,600	.4836	$ 1,741
Gnd Launcher	B534	240	9.2877	$ 2,229
	B535	572	15.9961	9,150
	B546	416	7.7347	3,218
	B577	264	3.5022	925
			Total	$ 15,522
60MM Mortar	B627	63	98.0440	$ 6,177
	B630	27	71.0159	1,917
	B632	478	55.9892	26,763
			Total	$ 34,857
81MM Mortar	C226	147	107.3830	$ 15,785
	C256	574	95.2880	54,695
	C276	66	92.8515	6,128
			Total	$ 76,608
105MM Howitzer	C443	776	122.0461	$ 94,708
	C449	280	176.8607	49,521
	C452	70	267.6040	18,732
	C454	224	97.0010	21,728
	C463	1	320.8663	321
			Total	$181,010
M60 Tank	C510	50	145.7417	$ 7,287
	C511	60	177.3284	10,640
	C512	26	296.6580	7,713
	C520	50	163.2672	8,163
			Total	$ 33,803
155MM Howitzer	D505	32	262.9480	$ 8,414
	D540	60	116.4677	6,988
	D541	184	143.6578	26,433
	D544	284	145.0380	41,191
	D548	8	42.3952	339
	D550	16	134.8340	2,157
			Total	$ 85,552

Weapon	DODIC	Qty Expended	Price	Cost
Hand Grenades	G881	360	7.0576	$ 2,541
	G895	2	11.7827	24
	G924	38	3.5352	134
	G930	32	12.1461	389
	G940	95	14.1880	1,348
	G945	61	16.5420	1,009
	G950	50	15.0360	752
			Total	$ 6,197
LAW	H557	90	95.8598	$ 8,627
Signals	L225	60	12.4704	$ 748
	L226	50	14.2484	712
	L227	50	16.8297	841
	L306	5	24.2410	121
	L307	72	36.6015	2,635
	L311	23	33.6783	775
	L312	144	19.6934	2,836
	L314	142	23.9382	3,399
	L324	112	26.7669	2,998
			Total	$ 15,065
Demolitions	M028	4	504.5214	$ 2,018
	M032	30	3.4181	103
	M039	3	97.4830	292
	M130	45	1.9757	89
	M131	100	.5919	59
	M421	2	320.5846	641
	M456	2,000	.0671	134
	M591	50	.9435	47
	M627	3	4.2157	13
	M670	800	.2682	215
	M757	9	156.5510	1,409
	M766	109	2.1375	233
	M913	2	5,556.4285	11,133
			Total	$ 16,386
Fuzes & Primers	N278	10	40.0230	$ 400
	N402	2	152.9230	306
	N412	50	67.5789	3,379
			Total	$ 4,085
TOW	PA66	2	3,549.68	$ 7,099
Dragon	PL23	5	2,487.96	$ 12,440

TOTAL AMMUNITION COSTS = $527,254

CAX 4-80

Weapon	DODIC	Qty Expended	Price	Cost
M16 Rifle	A068	2,880	.2342	$ 674
	A071	110,040	.155	17,056
	A080	45,600	.0992	4,523
			Total	$ 22,563
M60 Mach Gun	A111	7,600	.2192	$ 1,666
	A131	52,000	.2867	14,908
			Total	$ 16,574
Cal.50 Mach Gun	A589	3,060	1.1141	$ 3,409
Gnd Launcher	B534	100	9.2877	$ 929
	B535	286	15.9961	4,575
	B568	504	4.3346	2,185
	B577	144	3.5022	504
			Total	$ 8,193
60MM Mortar	B627	198	98.044	$ 19,413
	B630	230	71.0159	16,334
	B632	600	55.9892	33,594
			Total	$ 69,341
81MM Mortar	C226	264	4.2423	$ 1,120
	C256	1,908	95.2880	181,810
	C276	252	92.8515	23,399
			Total	$206,329
105MM Howitzer	C443	374	122.0461	$ 45,645
	C448	1	32.3409	32
	C449	54	176.8607	9,550
	C454	50	97.0010	4,850
			Total	$ 60,077
M60 Tank	C510	168	145.7417	$ 24,485
	C511	72	177.3284	12,768
	C512	48	296.6580	14,240
			Total	$ 51,493
Hand Grenades	G895	9	11.7827	$ 106
	G930	44	12.1461	534
	G940	18	14.1880	255
	G945	70	16.5420	1,158
	G950	50	15.0360	752
	G963	27	18.5914	502
			Total	$ 3,307

Weapon	DODIC	Qty Expended	Price	Cost
LAW	H557	250	95.8595	$ 23,965
Signals	L225	15	12.4704	187
	L226	15	14.2484	214
	L227	15	16.8297	252
	L306	20	24.2410	485
	L307	39	36.6015	1,427
	L312	80	19.6934	1,575
	L314	78	23.9302	1,867
	L324	20	26.7669	535
	L495	3	14.6333	44
	L598	30	3.0108	90
	L599	30	2.6670	80
			Total	$ 6,756
Demolitions	M028	2	504.5214	$ 1,009
	M030	30	1.8405	55
	M032	25	3.4181	85
	M130	30	1.9757	59
	M131	60	.5919	36
	M456	500	.0671	34
	M670	200	.2682	54
	M757	2	156.5510	313
	M766	50	2.1375	107
	M913	2	5,566.4285	11,133
			Total	$ 12,885
Fuzes & Primers	N335	1,106	13.3271	$ 14,740
	N402	60	152.9230	9,175
	N412	332	67.5789	22,436
			Total	$ 46,351
TOW	PA66	3	3,549.68	$ 10,649
Dragon	PL23	8	2,487.96	$ 19,904

TOTAL AMMUNITION COST = $561,796

CAX 5-80

M16 Rifle	A068	3,280	.2342	$ 768
	A071	99,080	.1150	11,394
			Total	$ 12,162

Weapon	DODIC	Qty Expended	Price	Cost
M60 MACH GUN	A111	3,100	.2192	$ 680
	A131	53,700	.2867	15,396
			Total	$ 16,076
Gnd Launcher	B534	200	9.2877	$ 1,858
	B535	170	15.9961	2,719
	B568	500	4.3346	2,167
			Total	$ 6,744
60MM Mortar	B627	292	98.0440	$ 28,629
	B632	1,179	55.9892	66,011
			Total	$ 94,640
81MM Mortar	C226	115	107.3830	$ 12,349
	C256	433	95.2880	41,260
	C276	162	92.8515	15,042
			Total	$ 68,651
105MM Howitzer	C443	855	122.0461	$104,349
	C449	12	176.8607	2,122
	C454	56	97.0010	15,042
			Total	$111,903
M60 Tank	C510	128	145.7417	$ 18,655
	C511	72	177.3284	12,768
	C512	48	296.6580	14,240
			Total	$ 45,663
Hand Grenades	G881	136	7.0576	$ 960
	G930	50	12.1461	607
	G940	44	14.1880	624
	G945	70	16.5420	1,158
	G950	30	15.0360	451
			Total	$ 3,800
LAW	H557	194	95.8595	$ 18,597
Rocket Launcher Gnd and Firing Kit	J143	1	921.8134	$ 922

Weapon	DODIC	QTY Expended	Price	Cost
Signals	L226	1	14.2484	$ 14
	L275	10	12.0607	120
	L306	28	24.2410	679
	L307	10	36.6015	366
	L311	26	33.6783	876
	L312	49	19.6934	965
	L314	64	23.9382	1,532
	L323	5	21.9889	110
	L324	14	26.7669	375
	L598	1	3.0108	3
			Total	$ 5,040
Demolitions	M028	2	504.4214	$ 1,009
	M030	43	1.8405	79
	M032	20	3.4181	68
	M039	3	97.4830	292
	M130	20	1.9757	40
	M131	35	.5919	21
	M456	325	.0671	22
	M670	250	.2682	67
	M757	2	156.5510	313
	M766	50	2.1375	107
	M914	1	3,769.2174	3,769
			Total	$ 5,787
Fuzes & Primers	N412	7	67.5789	$ 473
Dragon	PL23	12	2,487.96	$ 29,856
TOW	PA66	8	3,549.68	$ 28,397

TOTAL AMMUNITION COST = 448,711

CAX 6-80

M16 Rifle	A068	8,200	.2342	$ 1,920
	A071	31,080	.1550	4,817
	A080	23,440	.0992	2,325
			Total	$ 9,062
M60 Mach Gun	A131	68,100	.2867	$ 19,524
Cal.50 Mach Gun	A576	70	.4836	$ 34
	A589	26,010	.4836	6,082
			Total	$ 6,116

Weapon	DODIC	QTY Expended	Price	Cost
Gnd Launcher	B534	496	9.2877	$ 4,607
	B535	247	15.9961	3,591
	B567	192	3.3584	645
	B569	792	21.5110	17,037
	B577	720	3.5022	2,522
			Total	$ 28,402
60MM Mortar	B627	79	98.0440	$ 7,745
	B630	108	71.0159	7,670
	B632	611	55.9892	34,209
			Total	$ 49,624
81MM Mortar	C226	96	107.3830	$ 10,309
	C256	999	95.2880	95,193
	C276	200	92.8515	18,570
			Total	$124,072
105MM Howitzer	C443	960	122.0461	$117,164
	C449	280	176.8607	49,521
	C452	50	267.604	13,380
	C454	200	97.0010	19,400
			Total	$199,465
M60 Tank	C511	430	177.3284	$ 76,251
	C512	180	296.6580	53,398
	C519	28	682.3785	19,107
	C520	550	163.2672	89,797
			Total	$238,553
Hand Grenades	G991	362	7.0576	$ 2,555
	G895	24	11.7827	283
	G924	25	3.5352	88
	G930	126	12.1461	1,530
	G940	147	14.1880	2,086
	G945	96	16.5420	1,588
	G950	82	15.0360	1,233
	G963	64	18.5914	1,190
			Total	$ 10,553
LAW	H557	345	95.8595	$ 33,072
Rocket Launcher Gnd and Firing Kit	J143	441	9.3995	$ 4,145

Weapon	DODIC	QTY Expended	Price	Cost
Signals	L225	80	12.4704	$ 998
	L226	70	14.2484	997
	L227	80	16.8297	1,354
	L306	50	24.2410	1,212
	L307	38	36.6015	1,391
	L311	30	33.6783	1,010
	L312	142	19.6934	2,796
	L495	32	14.6333	468
	L596	30	12.2626	368
	L598	300	3.0108	903
	L599	215	2.667	573
			Total	$ 12,070
DEMOLITIONS	M028	10	504.5214	$ 5,045
	M030	192	1.8405	353
	M032	144	3.4181	492
	M039	5	97.4830	487
	M097	4	.4354	2
	M098	4	1.2380	5
	M130	186	1.9757	367
	M131	165	.5919	98
	M420	3	134.1484	402
	M421	3	320.5846	962
	M456	1,675	.0671	112
	M591	50	.9435	47
	M626	5	3.6138	18
	M627	14	4.2157	59
	M630	10	7.1131	71
	M670	1,000	.2682	268
	M757	8	156.5510	1,252
	M766	300	2.1375	641
	M810	62	.0477	3
	M913	2	5,566.4285	11,133
	M914	1	3,769.2174	3,769
			Total	$ 25,586
Fuzes & Primers	N412	50	67.5789	$ 3,379
TOW	PA66	2	3,549.68	$ 7,099
	VX94	250	1.2261	307
			Total	$ 7,406
Dragon	PL23	16	2,487.96	$ 39,807

TOTAL AMMUNITION COST = $81,0836

CAX 7-80

Weapon	DODIC	QTY Expended	Price	Cost
M16 Rifle	A068	7,180	.2342	$ 1,746
	A071	208,320	.1550	32,290
	A080	101,280	.0992	10,047
			Total	$ 44,083
M60 Mach Gun	A111	10,400	.2192	$ 2,280
	A131	48,000	.2867	13,762
			Total	$ 16,042
Cal.50 Mach Gun	A589	6,970	.4836	$ 3,371
Gnd Launcher	B534	120	9.2877	$ 1,115
	B535	7	15.9961	112
	B569	416	21.5110	8,949
			Total	$ 10,176
60MM Mortar	B627	87	98.0440	$ 8,530
	B630	72	71.0159	5,113
	B632	643	55.9892	36,001
			Total	$ 49,644
81MM Mortar	C226	150	107.3830	$ 16,107
	C256	861	95.2880	82,043
	C276	139	92.8515	12,906
			Total	$110,966
105MM Howitzer	C443	210	122.0461	$ 25,630
	C449	82	176.8607	14,503
	C452	202	267.6040	54,056
	C454	304	97.0010	29,488
			Total	$123,677
M60 Tank	C511	312	177.3284	$ 55,326
	C512	36	296.658	10,680
	C519	20	682.3785	13,648
	C520	60	163.2672	9,796
			Total	$ 89,450
Hand Grenades	G878	55	1.0290	$ 57
	G895	28	11.7827	330
	G930	42	12.1461	510
	G940	32	14.1880	454
	G945	128	16.5420	2,117
	G950	16	15.0360	241
			Total	$ 3,709

Weapon	DODIC	QTY Expended	Price	Cost
LAW	H557	114	95.8595	$ 10,928
Rocket Launcher Gnd and Firing Kit	J143	4	921.8134	$ 3,687
Signals	L226	47	14.2484	$ 670
	L306	18	24.2410	436
	L307	58	36.6015	2,123
	L311	36	33.6783	1,212
	L312	52	19.6934	1,024
	L314	48	23.9382	1,149
			Total	$ 6,614
DEMOLITIONS	M028	3	504.5214	$ 1,514
	M030	150	1.8405	276
	M032	112	3.4181	383
	M039	2	97.4830	195
	M097	4	.4354	2
	M098	4	1.2380	5
	M130	37	1.9757	73
	M131	261	.5919	154
	M327	11	.1509	2
	M420	1	134.1484	134
	M421	1	320.5846	321
	M456	1,000	.0671	67
	M591	35	.9435	33
	M670	500	.2682	134
	M766	103	2.1375	220
	M913	2	5,566.4285	11,133
	M914	1	3,679.2174	3,769
			Total	$ 18,415
Fuzes & Primers	N278	10	46.0230	$ 460
	N402	23	152.9230	3,517
	N412	25	67.5789	1,689
			Total	$ 5,666
TOW	PA66	4	3,549.68	$ 14,199
	VX94	50	1.2261	61
			Total	$ 14,260
Dragon	PL23	12	2,487.96	$ 29,856

TOTAL AMMUNITION COST = $540,544

APPENDIX A-15

TYPES OF WPNS ACCOUNTING FOR MAJORITY OF GROUND AMMUNITION COST

Weapon	1-79	2-79	3-79	2-80	3-80	4-80	5-80	6-80	7-80
M16A1 Rifle	$ 13,919	$ 18	$ 0	$ 8,972	$ 10,503	$ 22,563	$ 12,162	$ 9,062	$ 44,083
M60 Mach Gun	19,185	0	0	11,380	17,789	16,574	16,076	19,524	16,042
Cal.50 Mach Gun	2,452	0	0	2,396	1,741	0	0	6,116	3,371
M203 GND Launcher	34,313	0	0	0	15,522	8,193	6,744	28,402	10,176
60MM Mortar	110,236	48,166	0	46,523	34,857	69,341	94,640	49,624	49,644
81MM Mortar	144,507	48,123	18,846	81,405	76,608	206,329	68,651	124,072	110,966
105MM Howitzer	66,605	120,244	113,194	112,515	181,010	60,077	111,903	199,465	123,677
M60 Tank	28,959	75,422	46,694	33,803	33,803	51,493	45,663	238,553	89,450
155MM Howitzer	95;543	95,766	0	0	85,552	0	0	0	0
Hand Grenades	3,025	0	942	3,175	6,197	3,307	3,800	10,553	3,709
TOW WPN	28,402	0	0	14,199	7,099	10,649	28,397	7,406	14,260
Dragon	29,856	9,952	0	39,807	12,440	19,904	29,856	39,807	29,856
Subtotal	$577,002	$397,691	$179,676	$354,175	$483,121	$468,430	$417,892	$732,584	$495,234
Total Ammo Cost	$803,815	$432,329	$190,738	$387,365	$527,254	$561,796	$448,711	$810,836	$540,544
175 MM Ammo Cost	$123,182	0	0	0	0	0	0	0	0
Total Ammo Cost Minus 175MM Ammo	$680,633	$432,329	$190,738	$387,365	$527,254	$561,796	$448,711	$810,836	$540,544
Percent of Total Ammo Cost	72%	92%	94%	91%	92%	83%	93%	90%	92%

Weapon	1-79	2-79	3-79	2-80	3-80	4-80	5-80	6-80	7-80
Percent of Total Ammo 175MM Ammo Cost	85%	92%	94%	91%	92%	83%	93%	90%	92%

Average percent of total ammo
cost minus 175MM ammo cost = 90%

APPENDIX A-16

STANDARD GROUND AMMUNITION ISSUE

Type WPM	DODIC	QTY/Day	#Days	#WPNS	STD Issue
1. M16A1 Rifle	A068	3.33	4	767	10,216
	A071	23.33	4	767	71,576
2. M60 Mach Gun	A131	215(ground)	4	37	31,820
		293.33(tanks)	4	2	2,347
		213.33(amphibs)	4	3	2,560
3. CAL .50Mach Gun	A576	66(ground)	4	5	1,320
		66.66(recon vehicle)	4	1	267
	A589	266.66(tank)	4	15	16,000
		266.66(amphibs)	4	10	10,666
4. M203 GND Launcher	B535	.366	4	81	188
	B546	4.43	4	81	1,485
5. 60MM Mortar	B627	7.5	4	12	360
	B630	3	4	12	144
	B632	19.5	4	12	936
6. 81MM Mortar	C226	7.2	4	6	173
	C256	36	4	6	864
	C276	4.8	4	6	115
7. 105MM Howitzer	C443	81	4	4	1,296
	C449	7	4	4	112
	C452	3	4	4	144
	C477	8.333	4	4	133
8. M60 Tank	C510	4.24	4	17	288
	C511	2.06	4	17	140
	C512	.8	4	17	54

Type WPN	DODIC	QTY/Day	# Days	# WPNS	STD ISSUE
9. Hand Grenades	G881	.088	4	936Marines	329
	G930	.003	4	936	11
	G940	.01	4	936	37
	G945	.015	4	936	56
	G950	.01	4	936	37
10. LAW	H557	36	4	1 INF BN	144
11. TOW	PA66			8	8(1 per tube)
12. Dragon	PL23			16	16(1 per tube)
13. 155MM Howitzer	D505		4	2	32
	D540		4	2	136
	D541		4	2	200
	D544		4	2	248
	D550		4	2	48

APPENDIX 17

SUBSTITUABLE GROUND AMMUNITION

Type WPN	Ammunition Category	Type Shown in App	Substitutable Rounds
M203 GND Launcher	High Explosive	B546	B568/B569
105MM Howitzer	High Explosive	C443	C444/C445
	Smoke WP	C477	C454
M60 Tank	HEP	C510	C518
	HEAT	C511	C508
Hand Grenade	Fragmentation	G881	G890

APPENDIX A-18

AIR AMMUNITION USAGE FOR PAST CAXS

NALC	2-80	3-80	4-80	5-80	6-80	7-80	Price
A165	800		4,500	4,950			$ .17
A665	900				3,100		2.91
A896		2,500	2,000	9,400			1.85
B113			1,110	930			3.24
B115			1,140	930			3.24
E134		96	12	16	4	160	79.00
E465		144	37			144	139.00
E481				58			178.00
E482	245	234			324	252	260.00
E508					4		379.00
E807	12	12	6	6	20	20	2,008.00
E957	150	150	80				13.35
E973	96	128		243	567		12.50
FW56					300		.70
F127					2	2	791.00
F372		304	37	58	292	261	7.25
F391		12					61.30
F415	1,600	200	100	100	1,200	209	.27
F431			100				.18
F448					320	160	.19
F541	13	348					61.00
F542				25			12.50
F562	204	293		240	372	372	.67
F574				29			70.00
F642					2	2	68.70

NALC	2-80	3-80	4-80	5-80	6-80	7-80	Price
F656		144	37		43	245	$ 54.00
F681	256	347	37	58	292	256	10.15
GW03					288	142	4.00
GW04		184	20	305	64	168	85.00
G104					144	144	75.00
G382					145	57	91.00
HW14	20	50	75		200	200	2.40
HW40		48			24	22	158.00
HW47		12					2.00
H138	22	12	20				802.63
H141				4			317.00
H142	18	8	10		28		450.00
H663	112					100	10.61
H664		182			938		4.35
H842	56		35	354	186	28	34.27
H847			164				18.00
H855	224	336		86	264	104	14.89
H861			70	186	100		21.00
H929	32	16		47	16		55.70
H930	69			56	32		61.00
H945	28	112			66		33.40
J102		358	43	257	672		80.00
J106	24	176	82	427	60	172	80.00
J247					53		237.00
J270			150	148			250.00
J271	224	91	36				425.00
J345	168		58	20	48		10.50

NALC	2-80	3-80	4-80	5-80	6-80	7-80	Price
KW01		3			7		$ 50.00
K705					12,750		.07
K900		10	2	2	11		75.00
K901		10	2	2	16		155.00
L109	4	6	2		12		299.00
L426	30	24	14		112	192	58.00
M190	304	870	10	55	2,415		.91
M341		6			16		31.80
M363					42	4	2.61
M364			60	60			1.74
M815		6			16		24.30

APPENDIX A-19

AIR AMMUNITION COST FOR PREVIOUS CAXS

NALC	2-80	3-80	4-80	5-80	6-80	7-80
A165	$ 136	$ 0	$ 765	$ 842	$ 0	$ 0
A665	2,619	0	0	0	9,021	0
A896	0	4,625	3,700	17,390	0	0
B113	0	0	3,596	3,013	0	0
B115	0	0	3,694	3,013	0	0
E134	0	7,584	948	1,264	316	12,640
E465	0	20,016	5,143	0	0	20,016
E481	0	0	0	10,324	0	0
E482	63,700	60,840	0	0	84,240	65,520
E508	0	0	0	0	1,516	0
E807	24,096	24,096	12,048	12,048	40,160	40,160
E957	2,002	2,002	1,068	0	0	0
E973	1,200	1,600	0	3,038	7,088	0
FW56	0	0	0	0	210	0
F127	0	0	0	0	1,582	1,582
F372	0	2,204	268	421	2,117	1,892
F391	0	736	0	0	0	0
F415	432	54	27	27	324	56
F431	0	0	18	0	0	0
F448	0	0	0	0	61	30
F541	793	2,123	0	0	0	0
F542	0	0	0	313	0	0
F562	137	196	0	161	249	249
F574	0	0	0	2,030	0	0
F642	0	0	0	0	137	137

NALC	2-80	3-80	4-80	5-80	6-80	7-80
F656	0	7,776	1,998	0	2,322	13,320
F681	2,598	3,522	376	589	2,964	2,598
GW03	0	0	0	0	1,152	568
GW04	0	15,640	1,700	25,925	5,440	14,280
G104	0	0	0	0	10,800	10,800
G382	0	0	0	0	13,195	5,187
HW14	48	120	180	0	480	480
HW40	0	7,584	0	0	3,792	3,476
HW47	0	24	0	0	0	0
H138	17,658	9,632	16,053	0	0	0
H141	0	0	0	1,268	0	0
H142	8,100	3,600	4,500	0	12,600	0
H663	1,188	0	0	0	0	1,061
H664	0	792	0	0	4,080	0
H842	1,919	0	1,199	12,132	6,374	960
H847	0	0	2,952	0	0	0
H855	3,335	5,003	0	1,281	3,931	1,549
H861	0	0	1,470	3,906	2,100	0
H929	1,782	891	0	2,618	891	0
H930	4,209	0	0	3,416	1,952	0
H945	935	3,741	0	0	2,204	0
J102	0	28,640	3,440	20,560	53,760	0
J106	1,920	14,080	6,560	34,160	4,800	13,760
J270	0	0	37,500	37,000	0	0
J271	95,200	38,675	15,300	0	0	0
J345	1,764	0	609	210	504	0
KW01	0	150	0	0	350	0

NALC	2-80	3-80	4-80	5-80	6-80	7-80
K705	0	0	0	0	893	0
K900	0	750	150	150	825	0
K901	0	1,550	310	310	2,480	0
L109	1,196	1,794	598	0	3,588	0
L426	1,740	1,392	812	0	6,496	11,136
M190	277	792	9	50	2,198	0
M341	0	191	0	0	509	0
M363	0	0	0	0	110	10
M364	0	0	104	104	0	0
M815	0	146	0	0	389	0
Total	$238,984	$272,561	$127,095	$198,013	$298,200	$221,377

APPENDIX A-20

TYPES OF AMMUNITION ACCOUNTING FOR MAJORITY OF TOTAL AIR AMMUNITION COST

NALC	NOMENCLATURE	2-80	3-80	4-80	5-80	6-80	7-80
	Real Bombs						
E134	MK77 Firebomb		7,584	948	1,264	316	12,640
E465	MK81 HE 250 lb.		20,016	5,143			20,016
E481	MK82 HE 500 lb.				10,324		
E482	MK82 HE 500 lb.	63,700	60,480			84,240	65,520
E807	CBU 55 FAE	24,096	24,096	12,048	12,048	40,160	40,160
	TOTAL	$87,796	$112,536	$18,139	$23,636	$124,716	$138,336
	Practice Bombs						
E957	MK4 Pract Bomb	2,002	2,002	1,068			
E973	MK76 Pract Bomb	1,200	1,600		3,038	7,088	
	TOTAL	$ 3,202	$ 3,602	$ 1,068	$ 3,038	$ 7,088	$ -0-
	2.75 Inch Rockets						
H842	M151 HE	1,919		1,199	12,132	6,374	960
H847	MK1 HE			2,952			
H855	Smoke Rkt	3,335	5,003		1,281	3,931	1,549
H861	MK67 Smoke Rkt			1,470	3,906	2,100	
	TOTAL	$ 5,254	$ 5,003	$ 5,621	$17,319	$12,405	$ 2,509
	2.75 Inch Practice Rockets						
H663	2.75 Inch Pract Rkt	1,138					
H664	2.75 Inch Pract Rkt		792			4,080	1,061
	TOTAL	$1,138	$ 792	$ -0-	$ -0-	$4,080	$ 1,061

NALC	NOMENCLATURE	2-80	3-80	4-80	5-80	6-80	7-80
	5 Inch Rockets						
H929	Smoke Rkt	1,782	891		2,618	891	
H930	Mk24 HE	4,209			3,416	1,952	
	TOTAL	$ 5,991	$ 891	$ -0-	$ 6,034	$2,843	$ -0-
	Accessories						
GW04	Firebomb Initiator		15,640	1,700	25,925	5,440	14,280
J102	2.75 Inch Rkt Mtr		28,640	3,440	20,560	53,760	
J106	2.75 Inch Rkt Mtr	1,920	14,080	6,560	34,160	4,800	13,760
J270	5 Inch Rkt Mtr MK49 Grain			37,500	37,000		
J271	5 Inch Rkt Mtr Mk88 Grain	95,200	38,675	15,300			
H138	Rkt Launcher, LAU 68 B/A	17,568	9,632	16,053			
H141	Rkt Launcher, LAU 10 C/A				1,268		
H142	Rkt Launcher, LAU 10 D/A	8,100	3,600	4,500		12,600	
	TOTAL	$122,788	$110,267	$ 85,053	$168,760	$ 76,600	$ 28,040
	Combined Total	$226,169	$233,091	$109,881	$168,760	$227,732	$169,946
	% of Total Ammo Cost	95%	86%	86%	85%	76%	77%

Average Percentage = 84%

2.75-INCH PRACTICE ROCKETS

NALC	NOMENCLATURE	2-80	3-80	4-80	5-80	6-80	7-80
H663	2.75" Pract Rkt	112					100
H664	2.75" Pract Rkt		182			938	
	TOTAL 2.75" Pract	112	182	0	0	938	100
	TOTAL 2.75" Rkts	392	518	269	526	1488	232
	% Pract of TOTAL	29%	35%			63%	43%

5-INCH ROCKETS

NALC	NOMENCLATURE	2-80	3-80	4-80	5-80	6-80	7-80
H929	Smoke Rkt	32	16		47	16	
H930	MK 24 HE	69			56	32	
	TOTAL 5" Rkts	101	16	0	103	48	0

APPENDIX A-21

TYPES AND NUMBERS OF BOMBS AND ROCKETS EXPENDED IN PREVIOUS CAXs

NALC	NOMENCLATURE	2-80	3-80	4-80	5-80	6-80	7-80
	REAL BOMBS						
E134	MK 77 Firebomb		96	12	16	4	160
E465	MK 81 HE 250 lb.		144	37			144
E481	MK 82 HE 500 lb.				58		
E482	MK 82 HE 500 lb.	245	234			324	252
E807	CBU 55 FAE	12	12	6	6	20	20
	TOTAL REAL BOMBS	257	486	55	80	348	576
	PRACTICE BOMBS						
E957	MK 4 Prac Bomb	150	150	80			
E973	MK76 Prac Bomb	96	128		243	567	
	TOTAL PRACT BOMB	246	278	80	243	567	0
	TOTAL ALL BOMBS	503	764	135	323	915	576
	% PRACT OF TOTAL	49%	36%	59%	41%	61%	
	AVG % PRACT BOMBS	49%					
	REAL 2.75-INCH ROCKETS						
H842	M 151 HE	56		35	354	186	28
H847	MK 1 HE			164			
H855	Smoke Rkt	224	336		86	264	104
H861	Smoke Rkt, MK 67			70	186	100	
	TOTAL REAL 2.75" Rkts	280	336	269	526	550	132

APPENDIX A-22

STANDARD NUMBER OF BOMBS AND ROCKETS BY TYPE OF AIRCRAFT

Type A/C	Avg Sorties/Day	#Days	Ammo Load	Ammo/CAX
A-4	8	6	6 Bombs	288 Bombs
F-4	8.6	6	10 Bombs	516 Bombs
A-6	5.5	6	15 Bombs	495 Bombs
AV-8	17.5	6	4 Bombs	420 Bombs
OV-10 (2.75" Rkt)	3	6	14 2.75" Rkts	252 2.75" Rkts
OV-10 (5" Rkt)	1	6	8 5" Rkts	48 5" Rkts
AH-1	$\frac{9.3}{2}$ = 4.6*	6	14 2.75" Rkts	386 2.75"Rkts

* AH-1s do not fire rockets on every sortie flown. Squadron Operations Officers estimate that they do so for only 50 percent of their sorties.

APPENDIX A-23

STANDARD AIR AMMUNITION PACKAGE

1. When A4s and A6s are used:

NALC	NOMENCLATURE	STANDARD NUMBER
BOMBS:		
E134	MK77 Firebomb	98
E465	MK81 HE, 250 lb.	98
E482	MK82 HE, 500 lb.	197
E807	CBU 55 FAE	6
E957	MK4 Pract Bomb	192
E973	MK76 Pract Bomb	192
	TOTAL BOMBS	783
2.75-Inch Rkts:		
H642	M151 HE	182
H855	Smoke Rkt.	182
H663	2.75" Pract. Rkt	137
H664	2.75" Pract Rkt	137
	TOTAL 2.75-Inch Rkts	638
5-Inch Rkts:		
H929	Smoke Rkt	24
H930	MK24 HE	24
	TOTAL 5-Inch Rkts.	48
Accessories:		
GW04	Firebomb Initiator	196
J102	2.75" Rkt MTR (F/OV-10)	252
J106	2.75" Rkt MTR (F/AH-1)	386
J270	5" Rkt MTR, MK49 Grain	24
J271	5" Rkt MTR, MK88 Grain	24
H138	Rkt Launcher, LAU 68 B/A	18
H142	Rkt Launcher, LAU 10 D/A	16

2. When AV8s and A6s are used:

BOMBS:		
E134	MK77 Firebombs	115
E465	MK18, HE, 250 lb.	115
E482	MK82, HE, 500 lb.	231
E807	CBU 55 FAE	6
E957	MK4 Pract Bomb	224
E973	MK76 Pract Bomb	224
	TOTAL BOMBS	915

NALC	NOMENCLATURE	STANDARD NUMBER
2.75-Inch Rkts.		
H842	M151, HE	182
H855	Smoke Rkt	182
H663	2.75" Pract Rkt	137
H664	2.75" Pract Rkt	137
	TOTAL 2.75-Inch Rkts	638
5-Inch Rkts:		
H929	Smoke Rkt	24
H930	MK24HE	24
	TOTAL 5-Inch Rkts	48
Accessories:		
GW04	Firebomb Initiator	230
J102	2.75" Rkt MTR (F/OV-10)	252
J106	2.75" Rkt MTR (F/AH-1)	386
J270	5" Rkt MTR, MK49 Grain	24
J271	5" Rkt MTR, MK88 Grain	24
H138	Rkt Launcher, LAU 68 B/A	18
H142	Rkt Launcher, LAU 10 D/A	16

3. When F4s and A6s are used:

BOMBS:		
E134	MK77, Firebomb	128
E465	MK81 HE, 250 lb.	127
E482	MK82 HE, 500 lb.	255
E807	CBU 55 FAE	6
E957	MK4 Pract Bomb	248
E973	MK76 Pract Bomb	247
	TOTAL BOMBS	1,011
2.75-Inch Rkts:		
H842	M151 HE	182
H855	Smoke Rkt	182
H663	Pract. Rkt	137
H664	Pract. Rkt	137
	TOTAL 2.75-Inch Rkts	638
5-Inch Rkts		
H929	Smoke Rkt	24
H930	MK24 HE	24
	TOTAL 5-Inch Rkts	48

NALC	NOMENCLATURE	STANDARD NUMBER
Accessories:		
GW04	Firebomb Initiator	256
J102	2.75" Rkt MTR (F/OV-10)	252
J106	2.75" Rkt MTR (F/AH-1)	386
J270	5" Rkt MTR, MK49 Grain	24
J271	5" Rkt MTR, MK88 Grain	24
H138	Rkt Launcher, LAU 68 B/A	18
H142	Rkt Launcher, LAU 10 D/A	16

APPENDIX A-24

AIRCRAFT STATISTICS FOR CAX OPERATIONS

UNIT	Sorties/Day	Hrs/Sorties
	A-4	
VMA 311(P)*	4	2.0
VMA-331 (L)**	10	.9
MAG 14 (L)	8	.9
VMA-211 (P)	6	1.7
VMA-223 (L)	8	.9
	AVG = 7.2	AVG = 1.48
	A-6	
VMA-224 (L)	7	1.6
VMA (AW)-121 (P)	4	2.0
VMA (AW)-332 (L)	5	1.6
MAG 14 (L)	6	1.5
	AVG = 5.5	AVG = 1.7
	A-8	
VMA-542 (L)	20	.6
MAG-14 (L)	18	.6
VMA-513 (P)	16	.7
VMA-231 (L)	16	.7
	AVG = 17.5	AVG = .65
	F-4	
MAG 31 (L)	10	1.5
VMFA-531 (P)	8	1.3
VMFA-323 (P)	8	1.2
	AVG = 8.6	AVG = 1.3
	AH-1	
HMA-369 (P)	8	1.7
HMA-169 (P)	10	1.8
HMA-269 (L)	8	1.9
	AVG = 8.7	AVG = 1.8

UNIT	Sorties/Day	Hrs/Sorties
	UH-1	
HML-367 (P)	12	.5
HML-267 (P)	5	.5
HML-167 (L)	7	.8
MAG 29 (L)	12	.9
	AVG = 9	AVG = .68
	CH-46	
HMM-263 (L)	16	1.5
HMM-268 (P)	25	1.8
HMM-163 (P)	24	1.7
HMM-164 (P)	25	1.8
	AVG = 22.5	AVG = 1.7
	CH-53	
HMH-461 (L)	8	1.6
HMH-363 (P)	12	1.8
HMH-361 (P)	12	1.8
	AVG = 10.6	AVG = 1.7
	OV-10	
VMO-1 (L)	6	2.1
VMO-2 (P)	5	2.0
	AVG = 5.5	AVG = 2.05

* The "L" in parenthesis means the UNIT is from FMFLANT.

** The "P" in parenthesis means the UNIT is from FMFPAC.

APPENDIX A-25

STANDARD AIRCRAFT FLIGHT HOURS

Type Aircraft	Avg Sorties/Day	Avg Hrs/ Sorties	#Days	Std Flight Hrs
A-4	7.2	1.48	6	63.9
A-6	5.5	1.7	6	56.1
AV-8	17.5	.65	6	68.25
F-4	8	1.3	6	62.4
AH-1	8.7	1.8	6	93.96
UH-1	9	.68	6	36.72
CH-46	22.5	1.7	6	229.5
CH-53	10.6	1.7	6	108.1
OV-10	5.5	1.05	6	67.7
RF-4B	1.0	1.7	6	10.2

APPENDIX A-26

STANDARD PERSONNEL FOR CAX PURPOSES

1. Ground Combat Element:

	Officers	Enlisted
Infantry Battalion	45	1,085
155MM Howitzer Battery	8	145
105MM Howitzer Battery	9	105
Tank Company	5	102
Amphibious Assault Platoon	1	33
Anti-Tank Platoon	0	22
TOTAL	68	1,492
Standard Number (25% less)	51	1,119

2. Logistic Support Element — 12 — 230

	Officers	Enlisted
Logistic Support Element	12	230

3. Air Combat Element

Fixed Wing:

	Officers	Enlisted
Det VMA (A-4)	5	30
Det VMA (AV-8)	5	25
Det VMFA (F-4)	10	30
Det VMA(AW) (A-6)	6	30
Det WMO (OV-10)	4	19
Det VMFP (RF-4B)	6	50
Total When A-4s are used (See note)	21	129
Total When AV-8s are used (See note)	21	124
Total When F-4s are used (See note)	26	129

Helicopters:

	Officers	Enlisted
Det HMM (CH-46)	8	25
Det HMH (CH-53)	8	25
Det HML (UH-1)	5	9
Det HMA (AH-1)	9	19
TOTAL	30	78

Air Contingency:

	Officers	Enlisted
Det H&MS	0	12
Det MABS	1	45
Det MWSG	0	21
Det MWCS	4	25
Det MATCS	0	7

	Officers	Enlisted
Det MASS	8	13
Det FAAD Btry	1	14
TOTAL	14	157

Note: A-4s, AV-8s, or F-4s will be used.

APPENDIX A-27

STANDARD GROUND AMMUNITION COST

TYPE WPN	DODIC	STD ISSUE	UNIT PRICE	COST
1. M16 Al Rifle	A068	10,216	.2342	$ 2,392.59
	A071	71,576	.1550	10,094.28
		TOTAL M16 Al Rifle		$ 13,486.87
2. M60 Mach Gun	A131	(GRND) 31,820	.2867	$ 9,122.79
		(TNKS) 2,347	.2867	672.88
		(AAV's) 2,560	.2867	733.95
		TOTAL MACH GUNS		$ 10,529.62
3. CAL.50 Mach Gun	A576	(GRND) 1,320	.4836	$ 638.35
		(RECON VEH) 267	.4836	129.12
	A589	(TNK) 16,000	.4836	7,737.60
		(AAV) 10,666	.4836	5,158.08
		TOTAL		$ 13,663.15
4. M203 Grenade Launcher	B535	118	15.9961	$ 1,887.54
	B546*	1,485	7.7347	11,486.03
		TOTAL		$ 13,373.57
5. 60MM MORTAR	B627	360	98.0440	$ 35,295.84
	B630	144	71.0159	10,226.29
	B632	936	55.9892	52,405.89
		TOTAL		$ 97,928.02
6. 81MM MORTAR	C226	173	107.3830	$ 18,577.26
	C256	864	95.2880	82,328.83
	C276	115	92.8515	10,677.92
		TOTAL		$111,584.01
7. 105MM Howitzer	C443*	1,296	122.0467	$158,172.52
	C449	112	176.8607	19,808.40
	C452	144	176.6040	39,830.98
	C477*	133	73.5011	9,775.65
		TOTAL		$227,587.55
8. M60 TANK	C510*	288	145.7411	$ 41,973.44
	C511	140	177.3284	24,825.98
	C512	54	296.6580	16,019.53
		TOTAL		$ 82,818.95

	TYPE WPN	DODIC	STD ISSUE	UNIT PRICE	COST
9.	HAND GRENADES	G881*	329	7.0576	$ 2,321.95
		G930	11	12.1461	133.61
		G940	37	14.1880	524.96
		G945	56	16.547	926.35
		G950	37	15.036	556.33
			TOTAL		$ 4,463.20
10.	LAW	H557	144	95.8595	$ 13,803.77
11.	TOW	PA66	8	3,549.68	$ 28,397.44
12.	DRAGON	PL23	16	2,487.96	$ 39,807.36
13.	155MM Howitzer	D505	32	262.9480	$ 8,414.34
		D540	136	116.4677	15,839.61
		D541	200	143.6578	18,731.56
		D544	248	145.0380	35,969.42
		D550	48	134.8340	6,472.03
			TOTAL		$ 95,426.96

TOTAL STANDARD GROUND AMMUNITION COST = $752,870.00

*See Appendix A-17 for Substitutable Rounds.

APPENDIX A-28

STANDARD AIR AMMUNITION COSTS

1. When A-4s and A-6s are used:

NALC	NOMENCLATURE	STD ISSUE	PRICE	TOTAL
BOMBS:				
E134	MK77Firebomb	98	$ 79.00	$ 7,742.00
E465	MK 81,HE, 250 lb.	98	139.00	13,622.00
E482	MK 82,HE, 500 lb.	197	260.00	51,220.00
E807	CBU 55 FAE	6	2,008.00	12,048.00
E957	MK 4 Practice Bomb	192	13.35	2,563.20
E973	MK 76 Practice Bomb	192	12.50	2,400.00
		TOTAL BOMBS		$89,595.00
2.75 Inch Rockets:				
H842	M 151 HE	182	34.27	6,237.14
H855	Smoke Rkt.	182	14.89	2,709.98
H663	Practice Rkt.	137	10.61	2,039.93
H664	Practice Rkt.	137	4.35	595.95
		TOTAL 2.75" Rocket		$11,583.00
5 Inch Rocket:				
H929	Smoke	24	55.70	1,336.80
H930	MK 24 HE	24	61.00	1,464.00
		TOTAL 5"	Rocket	$ 2,800.80
ACCESSORIES:				
GW04	Firebomb Initiator	196	85.00	16,660.00
H138	Rkt. Launcher, Lau 68 B/A	18	802.63	14,447.34
H142	Rkt. Launcher, Lau 10 D/A	16	450.00	7,200.00
J102	2.75" Rkt. Mtr(F/OV-10)	252	80.00	20,160.00
J106	2.75" Rkt.Mtr(F/AH-1)	386	80.00	30,880.00
J270	5" Rkt. Mtr, MK 49 Grain	24	250.00	6,000.00
J271	5" Rkt. Mtr, MK 88 Grain	24	425.00	10,200.00
		TOTAL ACCESSORIES		$105,547.34
TOTAL				$209,526.14

2. When AV-8s and A-6s are used:

NALC	NOMENCLATURE	STD ISSUE	PRICE	TOTAL
BOMBS:				
E134	MK 77 Fire Bomb	115	79.00	$ 9,085.00
E465	MK 81 HE 250 lb.	115	139.00	15,985.00
E482	MK 82 HE 500 lb.	231	260.00	60,000.00

NALC	NOMENCLATURE	STD ISSUE	PRICE	TOTAL
E807	CBU 55 FAE	6	$2,008.00	$ 12,048.00
E957	MK 4 Practice	224	13.35	2,990.40
E973	MK 76 Practice	224	12.50	2,800.00
		TOTAL BOMBS		$102,968.40

ROCKETS:

2.75 Inch

H842	MK 151 HE	182	34.27	6,237.14
H855	Smoke	182	14.89	2,709.98
H663	Practice	137	10.61	1,453.57
H664	Practice	137	4.35	595.95
		TOTAL 2.75" Rockets		$10,996.64

5 Inch

H929	Smoke	24	55.70	1,336.80
H930	MK 24 HE	24	61.00	1,464.00
		TOTAL 5" Rockets		$ 2,800.80

ACCESSORIES:

GW04	Fire Bomb Initiator	230	85.00	19,550.00
H138	Rkt Launcher Lau 68 B/A	18	802.63	14,447.34
H142	Rkt Launcher Lau 10 D/A	16	450.00	7,200.00
J102	2.75" Rkt Mtr (F/OV-10)	252	80.00	20,160.00
J106	2.75" Rkt Mtr (F/AH-1)	386	80.00	30,880.00
J270	5" Rkt Mtr MK 49 Grain	24	250.00	6,000.00
J271	5" Rkt Mtr MK 88 Grain	24	425.00	10,200.00
		TOTAL ACCESSORIES		$108,437.34

TOTAL $225,203.18

3. When F-4s and A-6s are used:

BOMBS:

E134	MK 77 Fire Bomb	128	79.00	$ 10,112.00
E465	MK 81 HE 250 lb.	127	139.00	17,653.00
E482	MK 82 HE 500 lb.	255	160.00	66,300.00
E807	CBU 55 FAE	6	2,008.00	12,048.00
E957	MK 4 Practice	248	13.35	3,310.80
E973	MK 76 Practice	247	12.50	3,087.50
		TOTAL BOMBS =		$112,511.30

2.75 Inch Rockets:

H842	MK 151 HE	182	34.27	6,237.14
H855	Smoke	182	14.89	2,709.98
H663	Practice	137	10.61	1,453.57
H664	Practice	137	4.35	595.95
		TOTAL 2.75" Rkts		$ 4,759.54

NALC	NOMENCLATURE	STD ISSUE	PRICE	TOTAL
5 Inch Rockets:				
H929	Smoke	24	55.70	$ 1,336.80
H930	MK 24 HE	24	61.00	1,464.00
		TOTAL 5" Rockets		$ 2,800.00
ACCESSORIES:				
GW04	Fire Bomb Initiator	256	85.00	21,760.00
H138	Rkt Launcher LAU 68 B/A	18	802.63	14,447.34
H142	Rkt Launcher LAU 10 D/A	16	450.00	7,200.00
J102	2.75" Rkt Mtr (F/OV-10)	252	80.00	20,160.00
J106	2.75" Rkt Mtr (F/AH-1)	386	80.00	30,880.00
J270	5" Rkt Mtr MK 49 Gr.	24	250.00	6,000.00
J271	5" Rkt Mtr MK 88 Gr.	24	425.00	10,200.00
		TOTAL ACCESSORIES		$110,647.34
TOTAL				$230,718.94

APPENDIX A-29

UNITED STATES MARINE CORPS
Marine Corps Air Ground Combat Center
Twentynine Palms, California 92278

3/DPO/rgc
7000
19 Aug 1980

From: Range Maintenance Officer
To: Captain CLARKSON, B. J., Naval Post Graduate School, SMC #1460, Monterey, California 93940

Subj: Range Maintenance Expenditures for CAX Exercises

1. The following figures are average expenditures for CAX exercises and Pre-CAX Training.

a.	Fuel (diesel) 181 gallons	$231.93
b.	MOGAS 9 gallons	$ 11.34
c.	MLT Target material 1400 square feet	$154.00
d.	MLT Target From	$280.00
e.	Plywood 1/2", 12 sheets	$188.00
f.	Paint 5 gallons	$ 24.00
g.	2" x 4" x 16" lumber (12)	$ 48.00
h.	6D nails	$ 6.00
	TOTAL	$943.27

2. Most of the fuel costs listed above are picked up by units supporting range maintenance.

D. P. Olson
D. P. OLSON

APPENDIX A-30

AIRCRAFT FUEL (OFC-01) AND MAINTENANCE (OFC-50) TAKEN FROM THE MARINE CORPS COST FACTORS MANUAL

TYPE AIRCRAFT	TYPE COST			
	FUEL(OFC-01)		MAINT(OFC-50)*	
	CAX CPH**	% OF A-6 CPH***	CAX CPH**	% OF A-6 CPH***
A-6	$ 597.63	100.00	$ 331.36	$ 100.00
A-4	347.96	58.22	137.93	41.62
AV-8	433.21	72.49	487.36	147.08
F-4****	956.85	160.09	391.59	118.18
AH-1	63.97	10.70	144.78	43.69
UH-1	53.85	9.01	142.31	42.95
CH-46	100.65	16.84	243.51	73.49
CH-53	159.09	26.62	268.94	81.16
OV-10	61.89	10.36	221.50	66.85
RF-4B	888.89	148.74	510.42	154.04
T/OA-4	308.84	51.68	109.81	33.14

*OFC-50, Organizational and Intermediate Maintenance Only.

**Calculated by Dividing Total Fuel Cost by Annual Flying Hours. Taken From Marine Corps Cost Factors Manual [16:4-39, 4-40].

***Ratios Established by Using Marine Corps Cost Factors Manual.

****Average, All Models of F-4s.

APPENDIX A-31

STANDARD AIRCRAFT FUEL (OFC-01) AND MAINTENANCE (OFC-50) COSTS/ FLIGHT HOUR

TYPE AIRCRAFT	TYPE COST			
	FUEL(OFC-01)		MAINT(OFC-50)*	
	CAX CPH	% OF A-6 CPH**	CAX CPH	% OF A-6 CPH**
A-6	$1,154.36	100.00	$ 171.92	100.00
A-4	672.07	58.22	71.56	41.62
AV-8	836.79	72.49	252.86	147.08
F-4***	1,848.01	160.09	203.18	118.18
AH-1	123.52	10.70	75.12	43.69
UH-1	104.01	9.01	73.84	42.95
CH-46	194.09	16.84	126.35	73.49
CH-53	307.31	26.62	139.53	81.16
OV-10	119.59	10.36	114.93	66.85
RF-4B	1,716.99	148.74	264.83	154.04
T/OA-4	657.43	51.67	56.97	33.14

*OFC-50, Organizational and Intermediate Maintenance only.

**Ratios Established by Using Marine Corps Cost Factors Manual.

***Average, All Models of F-4s.

APPENDIX A-32

STANDARD AIRCRAFT FUEL (OFC-01) COST PER CAX

1. When A-4s are used:

TYPE AIRCRAFT	STD FLIGHT HRS.	COST/HR(FUEL)	FUEL COST
A-4	$ 63.70	$ 672.00	$ 42,806.00
A-6	56.10	1,154.00	64,739.00
AH-1	93.96	123.00	11,557.00
UH-1	36.96	104.00	3,843.00
CH-46	229.50	194.00	44,523.00
CH-53	108.10	307.00	33,187.00
OV-10	67.70	119.59	8,056.00
RF-4B	10.20	1,717.00	17,513.00
TOTAL OFC-01 (FUEL) COST			$226,224.00

2. When AV-8s are used:

AV-8	68.25	837.00	57,125.00
A-6	56.10	1,154.00	64,739.00
AH-1	93.96	123.00	11,557.00
UH-1	36.96	104.00	3,843.00
CH-46	229.50	194.00	44,523.00
CH-53	108.10	307.00	33,187.00
OV-10	67.70	119.59	8,056.00
RF-4B	10.20	1,717.00	17,513.00
TOTAL OFC-01 (FUEL) COST			$240,543.00

3. When F-4s are used:

F-4	62.40	1,848.00	115,315.00
A-6	56.10	1,154.00	64,739.00
AH-1	93.96	123.00	11,557.00

TYPE AIRCRAFT	STD FLIGHT HRS.	COST/HR(FUEL)	FUEL COST
UH-1	$ 36.96	$ 104.00	$ 3,843.00
CH-46	229.50	194.00	44,523.00
CH-53	108.10	307.00	33,187.00
OV-10	67.70	119.59	8,056.00
RF-4B	10.20	1,717.00	17,513.00
TOTAL OFC-01 (FUEL) COST			$298,733.00

APPENDIX A-33

STANDARD AIRCRAFT MAINTENANCE (OFC-50) COST

1. When A-4s Are Used.

TYPE AIRCRAFT	STD FLIGHT HRS	COST/HR	MAINT COST
A-4	63.70	$ 72.00	$ 4,586.00
A-6	56.10	172.00	9,649.00
AH-1	93.96	75.00	7,047.00
UH-1	36.96	74.00	2,735.00
CH-46	229.50	126.00	28,917.00
CH-53	108.10	139.00	15,026.00
OV-10	67.70	115.00	7,786.00
RF-4B	10.20	265.00	2,703.00
TOTAL OFC-50 (O&I MAINT) COST			$78,449.00

2. When AV-8s Are Used.

AV-8	68.25	253.00	$17,267.00
A-6	56.10	172.00	9,649.00
AH-1	93.96	75.00	7,047.00
UH-1	36.96	74.00	2,735.00
CH-46	229.50	126.00	28,917.00
CH-53	108.10	139.00	15,026.00
OV-10	67.70	115.00	7,786.00
RF-4B	10.20	265.00	2,703.00
TOTAL OFC-50 (O&I MAINT) COST			$91,130.00

TYPE AIRCRAFT	STD FLIGHT HRS	COST/HR	MAINT COST
3. When F-4s Are Used.			
F-4	62.4	203.00**	$12,667.00
A-6	56.1	172.00	9,649.00
AH-1	93.96	75.00	7,047.00
UH-1	36.96	74.00	2,735.00
CH-46	229.5	126.00	28,917.00
CH-53	108.1	139.00	15,026.00
OV-10	67.7	115.00	7,786.00
RF-4B	10.2	265.00	2,703.00
TOTAL OFC-50 (O&I MAINT) COST			$86,530.00

*Costs shown are for organizational and intermediate maintenance only - Marine Corps wide data [16:4-39,4-40].

**Amount shown is average figure for all models of F-4's.

APPENDIX A-34

STANDARD AIRCRAFT FUEL COST FOR CAX 4-80

TYPE A/C	COST RATIO(Y)	FLT TIME BY TYPE A/C(Z)	COST PER FLT HR *	CAX FUEL COST
A-6	1.0	47.8	$ 920.15	$ 43,987.00
A-4	.5822	25.7	535.71	13,768.00
AV-8	.7249	64.4	667.01	42,954.00
F-4	1.6009	0	1,473.06	0
AH-1	.1070	193.4	98.46	19,041.00
UH-1	.0901	75.8	82.91	6,285.00
CH-46	.1684	206.8	154.95	32,044.00
CH-53	.2662	108.2	244.94	26,503.00
OV-10	.1036	68.3	95.33	6,510.00
RF-4B	1.4874	0	1,368.63	0
	TOTAL CAX 4-80 AIRCRAFT FUEL COST			$191,088.00

* To calculate A-6 fuel cost per hour:

$$47.8x + 25.7(.5822x) + 64.4(.7249x) + 193.4(.1070x) + 75.8(.0901x) + 206.8(.1684x) = 108.2(.2662x) + 68.3(.1036x) = \$191,088.00$$

$$207.67x = \$191,088.00$$

$$\underline{\underline{x = \$\quad 920.15}} \text{ CPH(Fuel) for A-6}$$

APPENDIX A-35

STANDARD AIRCRAFT FUEL COST FOR CAX 5-80

TYPE A/C	COST RATIO (Y)	FLT TIME BY TYPE A/C (Z)	COST PER* FLT HR	CAX FUEL COST
A-6	1.0	39.6	$1,152.55	$ 45,641.00
A-4	.5822	29.8	671.01	19,994.00
AV-8	.7249	69.1	835.48	57,730.00
F-4	1.6009	0	1,845.11	0
AH-1	.1070	156.0	123.32	19,236.00
UH-1	.0901	69.6	103.84	7,227.00
CH-46	.1684	165.1	194.09	32,042.00
CH-53	.2662	105.5	306.81	32,366.00
OV-10	.1036	53.2	119.40	6,352.00
RF-4B	1.4874	8.7	1,714.30	14,912.00

TOTAL CAX 5-80 AIRCRAFT FUEL COST =$235,500.00

* To calculate A-6 cost per flight hour:

$$39.6x + 29.8(.5822x)+69.1(.7249x)+156(.1070x)+ 69.6(.0901x)+165.1(.1684x)+105.5(.2662x)+ 53.2(.1036x)+8.7(1.4874x) = \$235,500.00$$

$$204.33x = \$235,500.00$$

$$\underline{\underline{x = \$\ 1,152.55}}\ \text{CPH(Fuel) for A-6}$$

APPENDIX A-36

STANDARD AIRCRAFT FUEL COST FOR CAX 6-80

TYPE A/C	COST RATIO (Y)	FLT TIME BY TYPE A/C (Z)	COST PER* FLT HOUR	CAX FUEL COST BY TYPE A/C
A-6	1.0	73.0	$ 1,288.33	$ 94,048.00
A-4	.5822	91.8	750.06	68,855.00
AV-8	.7249	0	933.91	0
F-4	1.6009	0	2,062.49	0
AH-1	.1070	102.0	137.85	14,061.00
CH-1	.0901	92.8	116.08	10,772.00
CH-46	.1684	71.7	216.95	15,554.00
CH-53	.2662	60.5	342.95	20,748.00
OV-10	.1036	49.1	133.47	6,552.00
RF-4B	1.4874	8.7	1,916.26	16,671.00
T/OA-4	.5167	32.2	665.68	21,434.00
	TOTAL CAX 6-80 AIRCRAFT FUEL COST =			$ 268,695.00

*To calculate A-6 fuel cost per hour:

$$73.0x + 91.8(.5822x) + 102.0(.1070x) + 92.8(.0901x) + 71.7(.1684x) + 60.5(.2662x) + 49.1(.1036x) + 8.7(1.4874x) + 32.2(.5167x) = \$268,695$$

$$208.56x = \$268,695.00$$

$$\underline{\underline{x = \$\ 1,288.33}} \text{ CPH (Fuel) for A-6}$$

APPENDIX A-37

STANDARD AIRCRAFT FUEL COST FOR CAX 7-80

TYPE A/C	COST RATIO(Y)	FLT TIME BY TYPE A/C (Z)	COST PER* FLT HOUR	CAX FUEL COST BY TYPE A/C
A-6	1.0	73.0	$1,256.40	$ 91,718.00
A-4	.5822	114.0	731.48	83,389.00
AV-8	.7249	0	910.76	0
F-4	1.6009	0	2,011.37	0
AH-1	.1070	102.0	134.43	13,712.00
UH-1	.0901	92.8	113.20	10,505.00
CH-46	.1684	71.7	211.58	15,171.00
CH-53	.2662	60.5	334.45	20,234.00
OV-10	.1036	49.1	130.16	6,391.00
RF-4B	1.4874	8.7	1,868.77	16,258.00
T/OA-4	.5167	32.2	649.18	20,904.00

TOTAL CAX 7-80 AIRCRAFT FUEL COST =$278,282.00

*To calculate A-6 fuel cost per hour:

$$73.0x + 114.0(.5822x) + 102.0\,(.1070x) + 92.8\,(.0901x) + 71.7\,(.1684x) + 60.5\,(.2662x) + 49.1\,(.1036x) + 8.7\,(1.4874x) + 32.2\,(.5167x) = \$278,282.00$$

$$221.49x = \$278,282.00$$

$$\underline{\underline{x = \$\ 1,256.40}}\ \text{CPH (fuel) for A-6}$$

APPENDIX A-38

STANDARD AIRCRAFT MAINTENANCE (OFC-50)* COST FOR CAX 6-80

TYPE A/C	COST RATIO(Y)	FLT TIME BY A/C TYPE(Z)	COST PER** FLT HOUR	CAX OFC-60 COST
A-6	1.0	73.0	$ 234.83	$ 17,143.00
A-4	.4162	91.8	97.74	8,972.00
AV-8	1.4708	0	345.39	0
F-4	1.1818	0	277.53	0
AH-1	.4369	102.0	102.60	10,465.00
UH-1	.4295	92.8	100.86	9,360.00
CH-46	.7349	71.7	172.58	12,374.00
CH-53	.8116	60.5	190.59	11,532.00
OV-10	.6685	49.1	156.99	7,708.00
RF-4B	1.5404	8.7	361.74	3,147.00
T/OA-4	.3314	32.2	77.82	2,506.00

TOTAL AIRCRAFT MAINTENANCE(OFC)COST FOR CAX 6-80=$ 83,206.00

*Organizational & Intermediate maintenance only - actual cost.

**To calculate A-6 maintenance cost per hour:

$$73.0x + 91.8\ (.4162x) + 102.0\ (.4369x) + 92.8\ (.4295x) + 71.7\ (.7349x) + 60.5\ (.8116x) + 49.1\ (.6685x) + 8.7\ (1.5404x) + 32.2\ (.3314x) = \$83{,}206.00$$

$$354.32x = \$\ 83{,}206.00$$
$$\underline{\underline{x = \$\quad 234.83}} \text{ CPH (Maint) for A-6}$$

APPENDIX A-39

STANDARD AIRCRAFT MAINTENANCE (OFC-50)* COST FOR CAX 7-80

TYPE	COST RATIO(Y)	FLT TIME BY A/C TYPE( )	COST PER** FLT HOUR	CAX OFC-50 COST
A-6	1.0	73.0	$ 109.01	$ 7,958.00
A-4	.4162	114.0	45.37	5,172.00
AV-8	1.4708	0	160.33	0
F-4	1.1818	0	128.83	0
AH-1	.4369	102.0	47.63	4,858.00
UH-1	.4269	92.8	46.82	4,345.00
CH-46	.7349	71.7	80.11	5,744.00
CH-53	.8116	60.5	88.47	5,352.00
OV-10	.6685	49.1	72.87	3,578.00
RF-4B	1.5404	8.7	167.92	1,461.00
T/OA-4	.3314	32.2	36.13	1,163.00

TOTAL AIRCRAFT MAINT (OFC-50) COST FOR CAX 7-80=$39,631.00

*Organizational & Intermediate maintenance only-actual cost.

**To calculate A-6 Maintenance cost per hour:

$$73.0x + 114.0\ (.4162) + 102.0\ (.4369x) + 92.8\ (.4295x) + 71.7\ (.7349x) + 60.5\ (.8116x) + 49.1\ (.6685x) + 87\ (1.5404x) + 32.2\ (.3314x) = \$39{,}631.00$$

$$363.56x = \$\ 39{,}631.00$$
$$x = \$\ 109.01 \quad \text{CPH (Maint) for A-6}$$

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